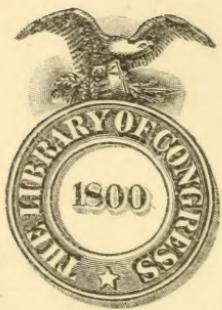


THE NEW
RHUBARB CULTURE

J. E. MORSE

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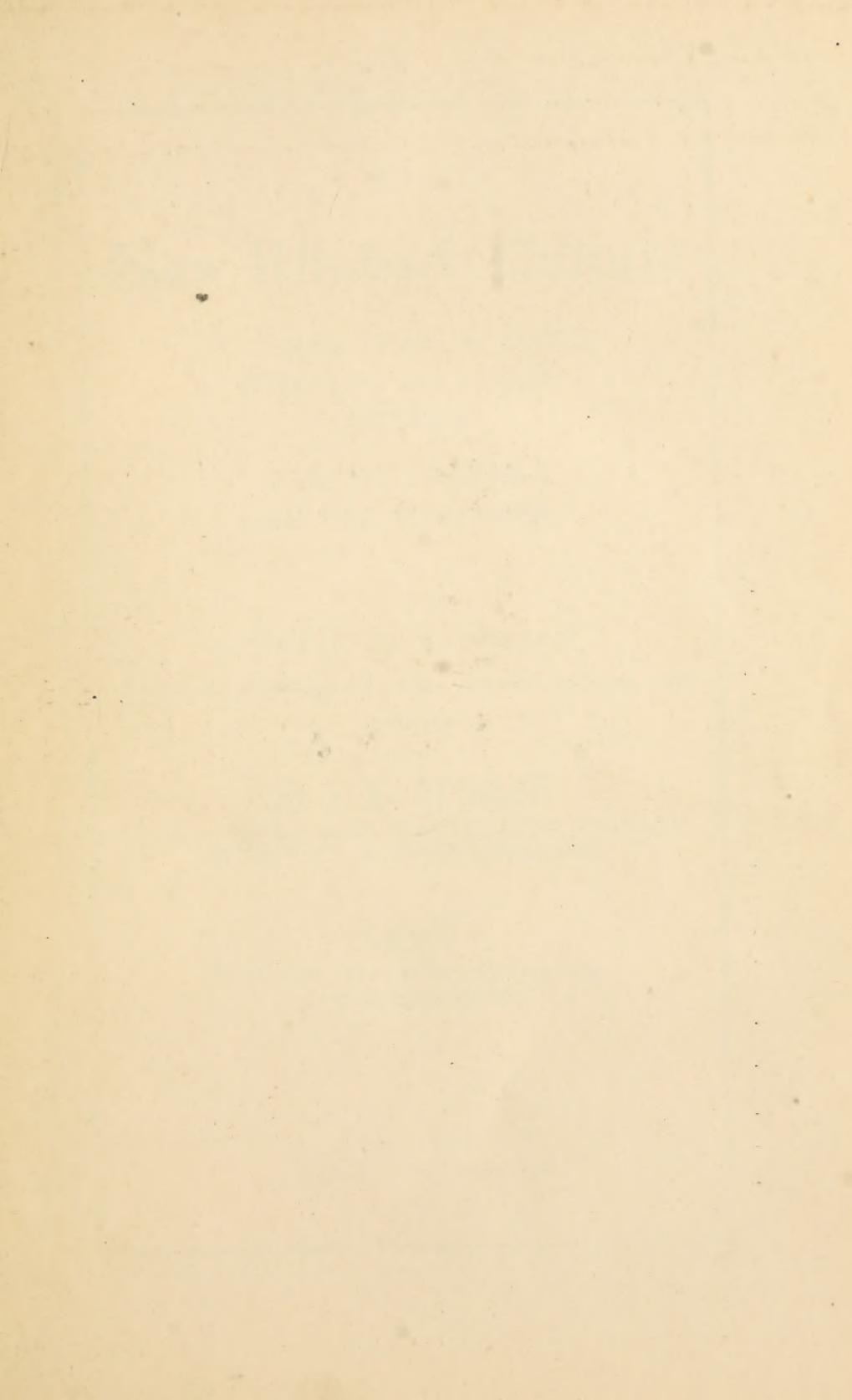


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The New Rhubarb Culture

*A Complete Guide to DARK
FORCING and FIELD
CULTURE*

HOW TO PREPARE *and* USE RHUBARB

Fully Illustrated

With original photographs taken expressly for this work

By J. E. MORSE

*Author of Garden Specials, Wheat Specials, etc. Winner of
Grand Prize in the National Garden Contest*

PART II

ADDITIONAL CHAPTERS ON OTHER METHODS

By G. BURNAP FISH

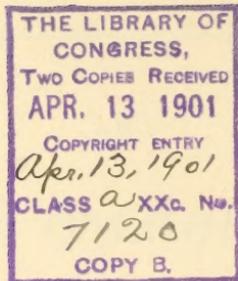
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CONTENTS.

Introduction and Note, By the Author

PART I.

CHAPTER I.

RHUBARB—ITS CULTIVATION AND HOME.	Page
A fragment of history—Its native home—Its acclimation—Not a vital question,	1

CHAPTER II.

THE FORCING PLACE.

The commercial cellar—The house cellar—Cellars with hard floors—Growing in hotbeds—Growing in the greenhouse—A cheap forcing cellar—Nooks and corners,	5
--	---

CHAPTER III.

WORK OF FORCING.

Starting the work—Forcing season—Two crops in one season—Setting the plants—Handling the roots—Age of roots for forcing—Best varieties,	16
---	----

CHAPTER IV.

HOW TO SUCCEED.

Heating—As to temperature—Ventilation—Light—Moisture—Fertilizing—Thinning out,	23
--	----

CHAPTER V.

HANDLING THE CROP.

Time of maturing—Gathering the crop—Tying up—Marketing, 29
--

CHAPTER VI.

FERTILIZERS.

Light or thin soils—Barnyard manure—Binders—Acidity of soil—Nitrate of soda—Jadoo fibre,	33
--	----

CHAPTER VII.

CULTURE.

Page

Soil—Preparation—Propagation—Unforced roots—Forced roots —Plants for setting—Growing from the seed—Tillage,	39
--	----

CHAPTER VIII.

COMPARISON OF OLD AND NEW METHODS.

Criticisms answered — The old method—The new method— Quality—Adaptability,	43
---	----

CHAPTER IX.

FUTURE OUTLOOK.

Magnitude of forcing industry—Creating demand—Benefits, . .	47
---	----

CHAPTER X.

Extracts from Bulletin, No. 55, June, 1899, Rhode Island Experiment Station. By Fred W. Card, M.S.,	50
--	----

CHAPTER XI.

HOW TO USE RHUBARB.

For dessert—To cook for sauce—To preserve for winter use, . .	59
---	----

PART II.

CHAPTER I.

VARIOUS FORCING METHODS.

Sash houses and cold frames—Hot water system—Steam forcing in open fields—Exhibition stalks—Home methods,	73
--	----

CHAPTER II.

EXPERIENCE IN FIELD CULTURE.

Methods of Long Island growers—Maryland—The Boston dis- trict—Illinois—The Northwest—The Pacific coast,	90
--	----

CHAPTER III.

VARIETIES AND STATION TESTS.

The leading sorts described—Range of adaptation—Northern limits—New seedlings—Work of the experiment stations, .	103
---	-----

CHAPTER IV.

HINTS AND HELPS.

For early market—Insects and blights—Culture of medicinal rhubarb—Pie plant for home use—Seed raising—Food value —Fertilizing constituents—Irrigation—Field jottings,	115
---	-----

LIST OF ILLUSTRATIONS.

PART I.

	Page
Ready for Forcing,.....	4
Ready to Market,.....	6
Grown in Hotbed for the Christmas Market,	10
A Bed in the House Cellar,.....	12
Plowing Out Rhubarb Roots,.....	14
Rhubarb Roots Ready for the Cellar,.....	18
Preparing for Market,.....	28
On the Display Stand in a Detroit Commission House,	31
Effects of Nitrate of Soda,.....	35
Tools Used in Rhubarb Culture,	42
Product of Frozen and Unfrozen Roots,.....	51
Leaf Development—In Light and in Darkness,	57

PART II.

Long Island Sash House,	74
Hot Water Forcing House,	75
Hot Water Forcing House (Interior View),.....	77
W. W. Rawson's Cold Frames for Rhubarb,.....	79
Long Island Cold Frame,.....	80
Sash and Shutter,	80
Steam Forcing in the Open Field,	84
Forcing with Liquid Manure,.....	87
Rhubarb Field at Jamaica, L. I.,	90
Rhubarb Ready for New York Market,.....	96
Rhubarb in Field Culture,.....	97
Method of Ridging in Fall and Spring,	99
Ridged Bed in Winter,.....	100
Stalks of Linnæus,.....	104
Stalks of Victoria,.....	104
Bunch of Victoria Ready for Market,	105
Bunch of Mammoth Red,	106

	Page
Hill of St. Martin's,	107
Monarch Rhubarb,	107
Packing Shed for Rhubarb,	116
Interior Plan of Packing Shed,	117
The Rhubarb Curculio,	119
Stalk Injured by Curculio,	120
Plant of the Medicinal Rhubarb,	121
Seedling and Root Cutting,	126

INTRODUCTION.

WITHIN a comparatively short time, the forcing of various garden vegetables has assumed such vast proportions, that now the products of the forcing house are exposed in all the city markets throughout the entire year, and many relishes in the way of radishes, lettuce, cucumbers, etc., that but a short time ago could only be obtained for a few weeks in their special season, are now the daily embellishments of the table. But the end is not yet; the forcing industry is only in its infancy, and will at no distant day revolutionize the whole gardening system.

The expensive methods of glass and greenhouse culture have heretofore made it possible for only the few to engage in the work, and the consequent high prices of the products thus grown have made it impossible for any but the more favored ones to enjoy the luxuries thus produced.

Experiments in the dark cellar are demonstrating that many vegetables may be there grown in their highest perfection, and ere long its inexpensive methods will to a large extent supersede the costly glass.

It is not the purpose of the following pages to induce farmers and gardeners to rush wildly into an enterprise as yet little known; but the rather to open up a way and a highway whereon many are reaching success and spanning the long gap of the profitless Winter months.

with a snug cash balance for the profit side of the ledger.

If it shall prove thus, and not only the tillers of the soil, but many a toiler in the humbler vocations of life shall find a grain from which to forge a "golden link in the iron chain of toil," The New Rhubarb Culture will more than realize the highest ambitions of

THE AUTHOR.

NOTE.

A BRIEF note regarding the method of dark forcing rhubarb, published in the *Rural New Yorker* for 1898, excited much interest and became the subject of many inquiries. In order to more clearly answer the questions thus raised a brief outline of the methods was later on published in the same paper.

This gave occasion for some writers with very little knowledge of the matter and a few borrowed ideas to tell what they evidently did not know about the subject. Whole paragraphs of the outline were woven into the articles without even the courtesy of quotation marks. A longer acquaintance with the work and some practical experience would cause them to disown the children of their earlier years and wonder why they had fathered them at first.

While fully agreeing with my illustrious ancestor, Solomon, that "There is nothing new under the Sun," the fact still remains that the woods are full of new methods and their results, developed it may be from old ideas. The ideas of the dark forcing method are doubtless not entirely new.

To say that I am the author and finisher of the method would be misleading.

But in so far as searching through the highways and byways for the fragmentary experiences and efforts of many growers, and in so far as gathering up these fragments and combining them with several years of

personal and practical experience and presenting them in the form now offered, the work is essentially my own.

To make this book still more encyclopedic, and to completely cover the whole subject of rhubarb culture, by the older methods also, Mr. Fiske has carefully compiled a comprehensive statement of such experiences, which forms Part II. of this work. Obviously, however, I am not responsible for Part II.

J. E. MORSE.

April, 1901.

PART I.

CHAPTER I.

RHUBARB — ITS CULTIVATION AND HOME.

A Fragment of History.—The cultivation of rhubarb, like some well established laws, extends back to the time when the memory of man runneth not to the contrary.

The value of the root as a drug has long been known, so long, in fact, that the discoverer of its medicinal qualities will never be known, and his name must lie hidden in the misty shadows of the past. Its record, however, is almost contemporaneous with the earliest written history as it is described in the Chinese herbal Pen-King supposedly dating back to nearly 3000 B. C.

For ages its cultivation was confined to its native home, China, but in a prepared form finding its way to various parts of the world. The cultivation extended into India to some extent and India rhubarb finally became an established article of commerce.

It remained for Russia, upon the establishment of trade relations with China, to get control of the trade, and to so supervise and improve the methods of preparation that Russian rhubarb became famous the world over and its price per pound was nearly three times that of opium.

The cultivation was finally begun in Siberia and along the Volga from whence it was introduced into England in 1573 and later into France. No attention, however, was paid to the leaf stalks, which presumably were inferior in size and quality to the product of to-

day; but the use of the leaves as a pot herb is mentioned in Queen Elizabeth's time.

The rhubarb cultivated as a vegetable is derived from *Rheum*, of which there are many species and widely distributed as to nativity. Nearly two hundred years ago a variety, probably *Rheum Rhaponticum*, was produced in Russia, which developed far larger and finer leaf stalks and was known as Crown rhubarb.

The varieties now in use are hybrids between *Rheum Rhaponticum*, *Rheum Undulatum*, and *Rheum Palmatum*, and in England were brought to a high state of perfection in the early part of the present century.

The old sorts in much favor were Tobolsk and Erford. Later on came Mitchell's Royal Albert and Dancer's Early Scarlet.

The principal varieties under present cultivation in this country are Myatt's Victoria, Myatt's Linnaeus, and the Mammoth with some other varieties, probably seedlings and bearing local names.

About forty years ago strenuous efforts were made in this country, and especially in Michigan, to cultivate it as a wine plant. However, the inferior quality of the wine together with its supposedly injurious effects, high war taxes, and other contingencies, combined to bring it into disfavor and the project was abandoned.

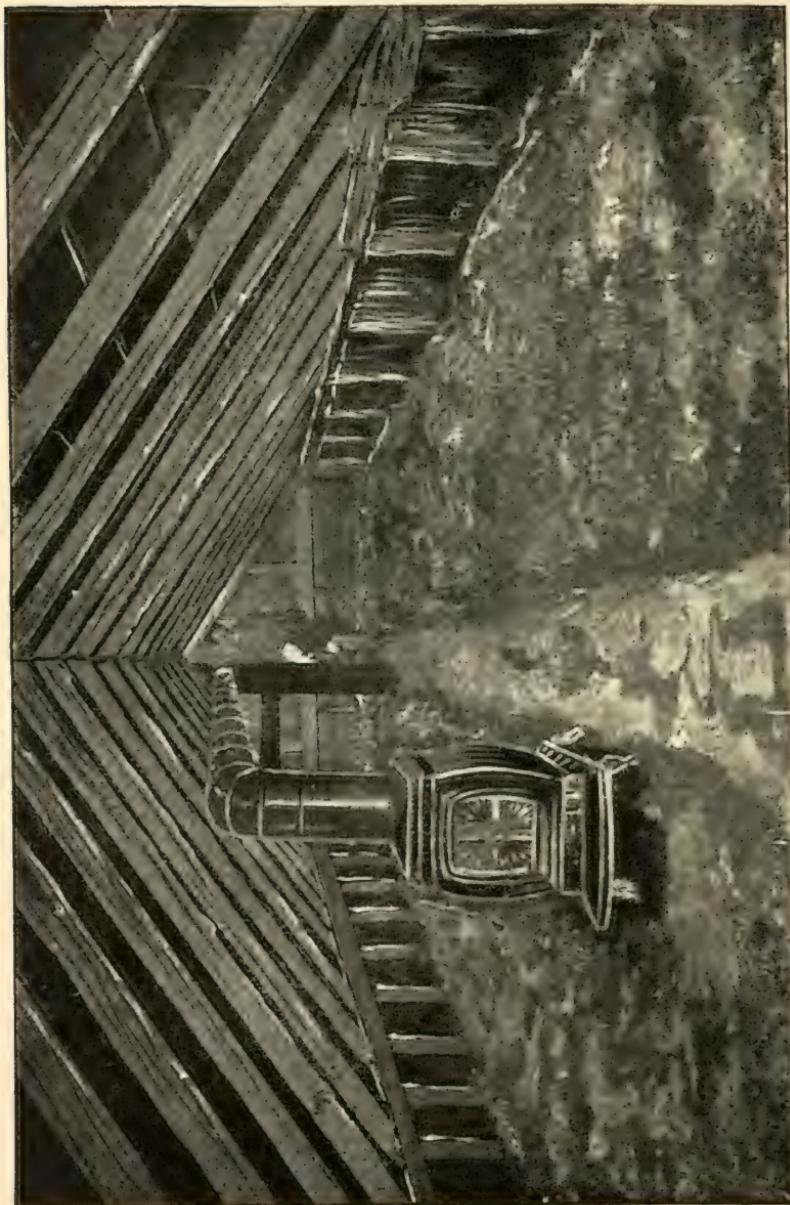
As a vegetable its cultivation is extending both in this country and portions, at least, of Europe.

Its Native Home.—As seen from the foregoing, the cultivation of rhubarb as a drug is of great antiquity and as to locality, widely disseminated. It will also be seen that as a vegetable, the varieties now in use are descendants of a variety originating in a far northern clime.

Its Acclimation.—The parent, having its birthplace in the rugged frosts and snows of Siberia, will its chil-

dren thrive in the warmer latitudes of our own country? Let us see: its native home was doubtless in the region of latitude 50. Near the close of the eighteenth century it was introduced into England, doubtless through the seed; and notwithstanding the abrupt climatic changes it had come to great perfection in the early part of the present century. This was accomplished through growing from the seed and hybridization. The mild and humid climate of England produces it in great perfection. The more vigorous climate of our northern latitudes produces it in abundance and instances of luxurious growth in the higher altitudes as far south as North Carolina are recorded. It may seem safe to say that through careful seed selection and hybridizing it may be successfully grown in nearly every section of the United States.

Not a Vital Question.—While the subject of acclimation is of great importance and well worth careful and continued experiment, it is not a question of life or death to the industry. The industry will grow; and if climatic conditions bar its production out of some localities or even countries, the product, when once introduced there, will be consumed and the market, at least, will not be barred.



READY FOR FORCING.

CHAPTER II.

THE FORCING PLACE.

In order to so present the method of forcing rhubarb that not only the farmer and gardener who may desire to grow for market purposes, but the owner of a village or city lot may provide a home supply of this wholesome luxury from January to April, various plans for the forcing place are suggested.

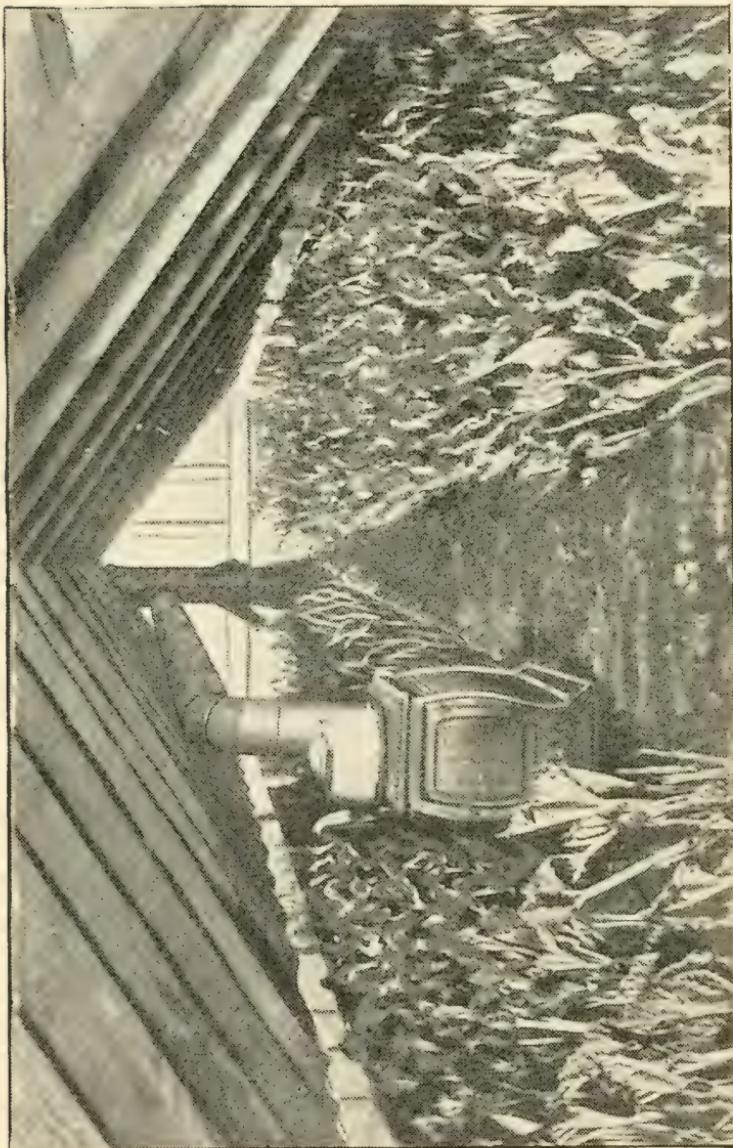
The Commercial Cellar.—The illustration “Ready For Forcing,” shows a view of a cheaply constructed cellar, much in favor with growers for the wholesale market. The size is 12 x 50 feet, holding between 500 and 600 plants set in beds five feet wide, on either side of a two foot passageway, running the entire length of the building.

In constructing a cellar of this kind the ground is excavated two feet in depth, and posts set two feet deep and six feet apart are rough boarded for the walls. The plates, 2 x 6 inches are spiked on top of posts; the rafters, same size, being set at a pitch sufficient to shed water, and give height to the cellar, which is seven feet in the center and three feet at the sides.*

The roof is of boards either lapped or laid double and covered (during the forcing season) with manure to a depth of eight inches.

The entrance is at one end of the cellar through a door leading into an entryway 6 x 12 feet, for the storage

* This cellar was built entirely of old lumber, and the cost was merely nominal. In using new material a saving might be made by using lighter stuff say, 2 x 4 in. for plates and rafters.



READY TO MARKET.

of fuel, etc. An inner door entirely excluding light and frost leads into the forcing room.

Heat is furnished by a small box stove set about 15 feet from the entrance. The pipe is carried to a flue at the rear end of the building. To insure as even distribution of heat as possible as well as to economize in fuel the pipe should be placed much lower than shown in the illustration.

The view shows the cellar filled with roots and heat just started. On Dec. 14, when the flash light was taken, the stalks were just appearing above ground. Twenty-seven days later (Jan. 10) 18 doz. were picked and sold at 70 cents per doz. or \$12.60 for the first picking.

"Ready To Market," is a view of the same cellar just before the second picking (Jan. 17) when twice the amount of the first picking was ready for market.

Several subsequent pickings were made, after which the roots were removed from the cellar and a second crop was grown in the same manner as the first.

This small cellar 12 x 50 feet yielded something over \$160 worth of rhubarb from the two crops grown in one Winter.

The House Cellar.—Many growers having roomy house cellars utilize them for the work, in addition to the regular forcing cellar described above. To this practice no objection can be offered by the most fastidious, as very little artificial moisture is required and consequently no dampness or objectionable odors are given off, unless the roots are neglected and left to decay after they have ceased bearing.

In this way the cellar may be utilized at a handsome profit during the Winter months; and the convenience in caring for, and harvesting the crop is no small item to carry to the profit side of the ledger.

An incident in point, the cellar of a near-by neighbor which the writer visited, gave a return of \$144 during the Winter. The space occupied was 36 x 54 feet and the only heat used was two large lamps.

On a bleak Winter's day with the mercury 10 or 15 degrees below zero, the good housewife will appreciate going from the busy kitchen right down into a forest of the beautifully colored rhubarb growing at her feet, ready to pull and prepare for the table; and should she tarry a bit to feast her eyes on the novel sight so rarely duplicated in Nature who shall chide her, even though the dinner be somewhat late in consequence?

Cellars with hard floors.—Do not fear to use cellars with brick, cement, or other hard floor. During forcing the roots make little or no growth and two or three inches of loose earth covered over the floor will be sufficient.

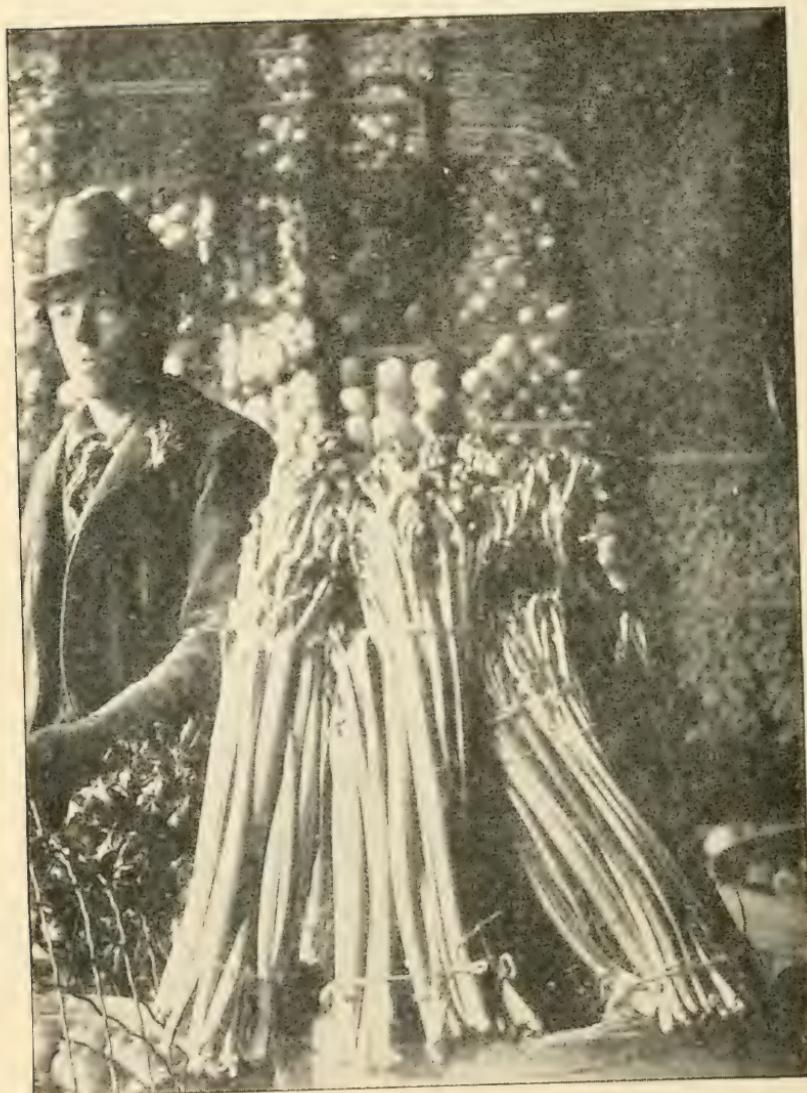
Growing in Hotbeds.—A method which gives the earliest and best paying crop of all, is to set the roots in hotbeds, removing, of course, the old manure and soil to sufficient depth to admit the full growth of the stalks. There is no extra expense, as the hotbeds are already on hand, and later on are used for starting the cabbage, tomato, egg and other plants. The boxes are covered with two layers of boards, breaking joints, to avoid as far as possible the leaching of snow or rain. Manure to the thickness of a foot or 18 inches is placed around the boxes, and covered on top to the depth of six inches. No heat other than that generated by the manure is used; should a higher temperature be required, fresh manure that has been piled until heated, is put on, and the forcing is thus hurried at will.

December 21, I visited the grounds of one of the pioneer growers of this section, and the first, I think,

to adopt the dark-growing method. He had his house cellar and two large forcing cellars filled; but as yet used no heat. A row of ten hotbeds were being filled, which were to be held in check until the last of February, when the manure would be applied, and forcing begun. Besides this, he had 12 boxes covered in one unbroken mound, six of which were for immediate use, and six to follow in succession. I walked over the mound, and there beneath my feet, shut away from the light and air, and forced entirely by the heat of the manure, the rhubarb was growing and ready for the market. December 20, from three of these boxes 6 x 14 feet in size, he picked 31 dozen, which brought, in the wholesale house, 75 cents per dozen, or \$23.25 for one picking. These boxes were of the Linnæus variety, and would give two more pickings; the second picking was expected to be best of all.

This grower is a gardener of over 40 years' experience, and says that this is the best paying crop he can raise, for the reason that the greater part of the labor is done after the other crops are secured, and the sales come at a time when so little else can be grown except by the expensive methods of growing under glass.

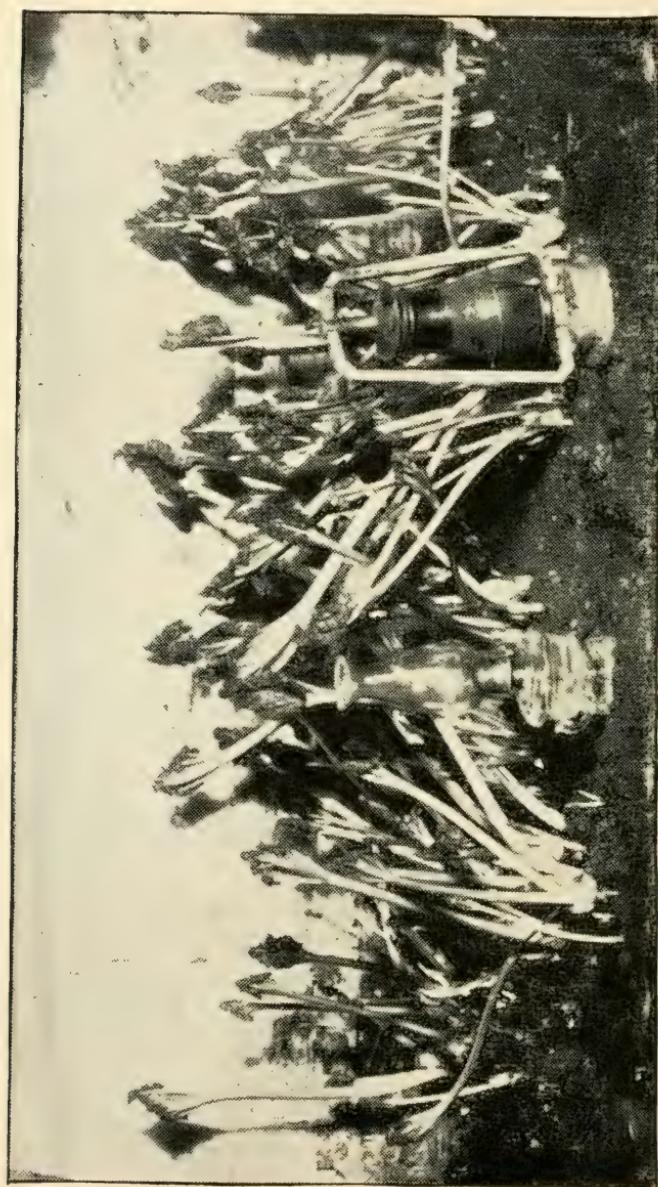
Growing in the Greenhouse.—The space under greenhouse benches may be used, by closely boarding the sides and ends to exclude the light. This plan has been adopted by greenhouse men to some extent; but while seemingly economical in the matter of heat is open to some objections. The expense of boarding up in such a manner that one side at least, is easily accessible, for placing in the roots and removing the crop will be no small item. Experiments clearly prove that the close warm quarters beneath the benches will give too high a temperature and the product will be



GROWN IN HOTBED FOR THE CHRISTMAS MARKET

inferior in color, quality and yield, to that grown out in the more open space. Too close proximity to the pipes gives too high a temperature which is the chief source of the trouble; and this can hardly be remedied without detriment to the crops growing on top of the benches. The strong heat shortens the bearing season of the rhubarb and will also leave the roots much impaired, if not wholly unfit for future use in propagating. However a quick growth and fair yield may be obtained and if no better place is at hand it will pay to use such spaces.

A Cheap Forcing Cellar.—With none of the above described places available a very cheap and serviceable cellar may be made by excavating for say, two feet and any size desired. The more convenient shape for covering and for convenience in work will be in proportions of one to three, or four. Build the sides above ground with poles, (any size convenient) to the required height, and for the pitch of roof cut the end poles shorter each time, and draw in the side poles sufficiently to make the lap at the corners. Shorten the poles according to their size, and the desired height of the building, large poles would need to be shorter than small ones, in order to avoid unnecessary height. It is better to lay up the sides and ends whole and saw out the doorway afterward, use 2 x 6 in. plank for the door frame spiking through into the end of each pole. Cover over with corn stalks, straw or other coarse litter, finishing with earth to a depth sufficient to insure against any possibility of freezing. A flue of sewer crock is easily constructed if one wished to heat with wood or coal, but an oil or gasoline stove or large lamp placed low down will do nicely for heating, if the cellar is not too large. Such



A BED IN THE HOUSE CELLAR.

a building will last for years and is very useful for other purposes outside the forcing season.

Nooks and Corners.—The foregoing is, of course, descriptive of the methods of the wholesale growers; the following suggestions are made with a view to reach every home. As remarked in the introduction, the forcing of vegetables is assuming vast proportions; but with all the progress thus far made no vegetable, rhubarb excepted, that can in any sense take the place of fruit has been utilized. The work is so simple and inexpensive that any family possessing a few rhubarb roots may now enjoy the luxury the entire Winter through.

A little thought will suggest a corner in the cellar, or lacking this, a storeroom or attic where a few roots may be set in a large box and protected from the light and cold, and give a supply of this most wholesome and delicious vegetable.

For the sole purpose of demonstrating how easily and cheaply the work may be done, a small bed was prepared in the house cellar. Only ten roots were used; being placed at the end of the cellar close beside a potato bin.

The illustration shows the bed in full bearing, with lamp and lantern for heating. The bed was shut off from the rest of the cellar by simply tacking an old hemp carpet to the floor and sleepers above, letting it fall to the cellar bottom. The wall formed one side of the enclosure and the carpet was so nailed to the floor above as to form the other side and ends. The heating cost less than two cents per day, and was only used at intervals. The bed was for family use. The bearing season was prolonged at will by using the heat only occasionally. The yield was something over 10 dozen bunches, worth at going prices about \$5.10.



PLOWING OUT RHUBARB ROOTS.

Note on Growing in Hotbeds.—The work of growing in hotbeds has one decided advantage which may not appear at first sight.

In the instance referred to under “Growing in Hotbeds” the roots were placed in, during the month of November, before any freezing had occurred. By this plan a crop may be forced before it could by any possibility be secured in any of the ordinary cellars described. It will be observed, however, that this plan of forcing entirely ignores one very essential feature of the general method viz., that of freezing the roots: but while entirely practical under certain conditions, it cannot be applied in general work and must not be attempted. It will not be successful in any ordinary cellar or in fact any place where very strong heat cannot be concentrated and brought low down to the roots.

With the hotbed boxes on hand, and an abundance of fresh manure to generate the heat and reinforce it as necessary, the forcing may be safely done and give an early crop and fancy prices that cannot be obtained if necessitated to wait for the roots to freeze. But the method is especially valuable in establishing the fact that the work may be successfully done in latitudes beyond the limit where freezing may be relied upon.

This plan of forcing is very exhausting, and the roots thus forced will be entirely worthless for purposes of propagation.

CHAPTER III.

WORK OF FORCING.

Starting the Work.—As ever increasing competition must be met by cheapened production, the prime object in every enterprise must be to minimize the labor.

As the forcing season approaches, with the cellar all in readiness, we should give attention to the preparation of tools for the work. While but few are required they should be of the best, and will consist of a good plow with well sharpened coulter and sharp clean-cutting spades or shovels. The plans for heating should also be carefully perfected. With these essentials duly provided for we are now ready for the work of the

Forcing Season.—This will depend on location, and weather conditions. Extended experiments have demonstrated beyond a doubt that by far the best results are obtained by thoroughly freezing the roots. While this general rule is laid down as positive and not to be deviated from, there are exceptions which were treated of under another heading, "Forcing in Hotbeds." This being the case it is better to leave the roots in the ground until there is prospect of sufficient cold weather to freeze the roots clear through. They will however take no injury if left exposed to any sort of weather for a reasonable time. In loose sandy soil which does not readily adhere, but crumbles off leaving the roots bare, it is better to turn them out when the ground is thoroughly soaked, or just before a hard freeze.

Two Crops in One Season.—With a plentiful supply of roots and inadequate room for forcing, two crops may

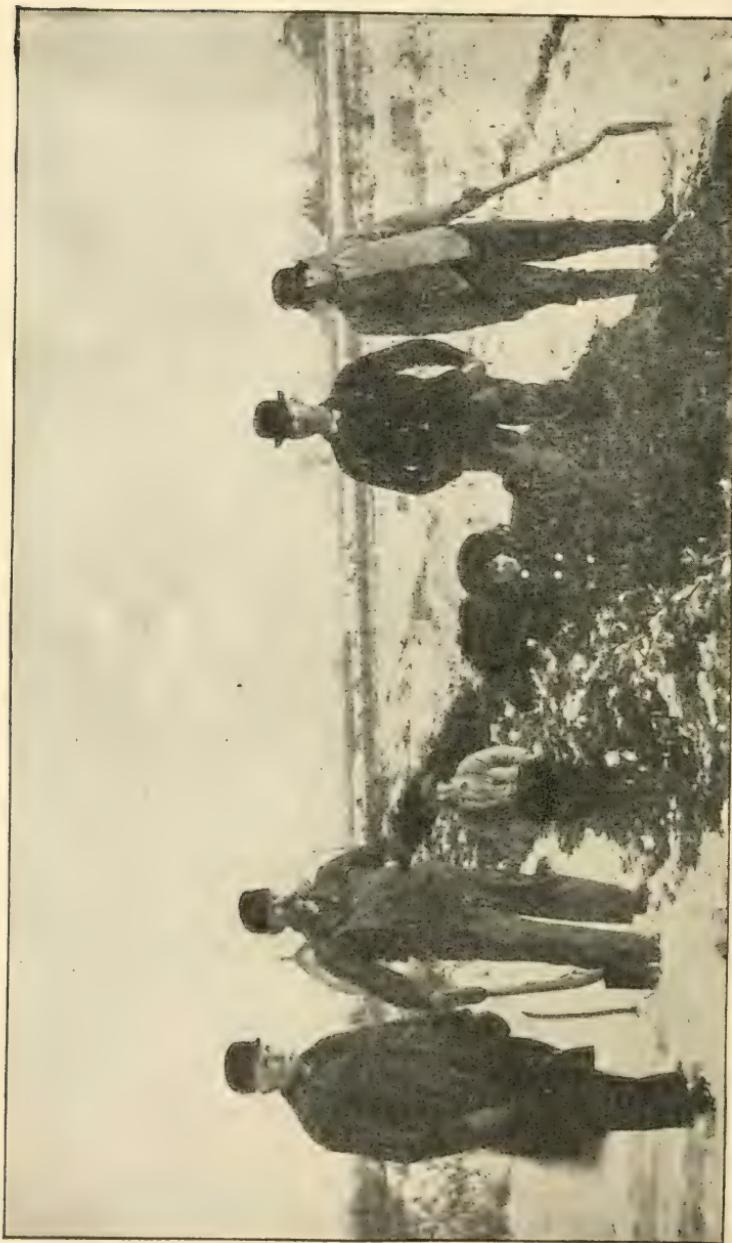
be grown in succession. In this case as soon as the first roots cease bearing they should be removed from the cellar and protected from severe freezing and thawing; this can best be done by piling them in a shed, or giving them a light covering of straw or coarse litter. In the Spring they may be used for propagating which will be treated of in another chapter. The roots for second crop may then be placed in the cellar and forcing continued.

Preparing the Roots.—In extensive operations it is economy to turn the roots out with the plow.

The illustration “Plowing Out Rhubarb Roots,” was taken on the grounds of an extensive grower and shows the work of preparing the roots for the cellar, in actual operation.

With a spade, a line or mark is made along the row, but four to six inches distant from it, as a guide to the plow. Set the plow as deeply as possible, turning the furrow away from the row; a second furrow is plowed on the opposite side of the row same distance from it as before, turning the roots over into the first furrow plowed. If the coulter is sharp and clean-cutting as it should be, this will cut off all the lateral prongs on two sides. Now with the spade turn the roots out so they shall not be buried in the loose soil of the furrow, trim off remaining prongs on the other sides, and leave them until ready to put into the cellar. In very dry or loose sandy soil the earth is liable to nearly all fall off the roots when turning them out; in this case simply turn the furrows away from both sides of the row of roots and leave the turning out and trimming up until the clumps are frozen. They can then be trimmed up and properly shaped with the loss of but very little soil.

The illustration “Rhubarb Roots Ready for the



RHUBARB ROOTS READY FOR THE CELLAR.

Cellar" shows the roots turned out of the furrow upon the snow-covered ground, and trimmed ready for forcing.

In small areas, or where from any cause plowing out would be impracticable the entire work may be neatly and rapidly done with the spade.

Setting the Plants.—For the work of setting in the roots, select if possible, a time when they are frozen solid, as they will be cleaner to handle and may be rolled or tumbled about like rocks without fear of injury. This is not material however, but greatly simplifies the work.*

Cellars will of course, vary much in size and shape; and setting in the clumps should be planned with regard to the utmost convenience in caring for, and harvesting the crop. If the cellar is long and narrow, one passageway through the center, extending the entire length of the building will be sufficient, while a large square room might require two or more parallel passageways, or one extending through the center the longest way, with lateral paths on either side placed at convenient distances for picking, in order to avoid trampling on the young stalks. Remembering that each clump will occupy about a square foot of space and that they are set as closely together as possible, it will not be difficult to so plan the position of passageways as to secure the desired results.

As the plants are set in position, loose earth should be at hand for filling underneath and between the clumps; enough may be used to entirely cover the crowns of the roots, or they may be left exposed and only the

*NOTE.—Do not make the mistake of supposing that the roots *must* be in a frozen condition when placed in the cellar, that is immaterial, provided the freezing has actually taken place previously. It is simply a matter of convenience and economy to handle the roots in a frozen condition.

crevices between the prongs of the roots and spaces between clumps filled in. If the cellar bottom is of loose earth, that may be used for the purpose, but if cement or other hard floors are used, then the soil will have to be carried in.

With the setting completed, the labor is practically over, and very little care is necessary to mature the crop.

Handling the Roots.—A very pleasing feature of the work is in the fact that with the freezing part well over, the crop may be matured almost at will. The forcing may begin at once or the roots may be held in a dormant state for weeks, which matter will of course be governed entirely by the temperature. If, as previously mentioned, two crops are grown in the same cellar, the forcing should begin as early as possible. The roots for the second crop may be left in the ground until required for use. However, in latitudes where long continued and severe freezing is the rule, the safe plan is to dig all the roots at one time, piling those required for the second crop in a shed, or otherwise slightly protecting them. In localities less rigorous, where the open state of the ground would most likely admit of digging in mid-winter the roots for second crop may be left in the field until wanted.

Whether one, or two crops are grown, one fact should be borne in mind if one desires to utilize the forced roots for propagating, the forcing process is very exhausting to the roots and should be discontinued as soon as lack of vigor in the growth of the stalks is noticeable; the growth can be stopped only by removal from the cellar or lowering the temperature to say 30 or 35 degrees. Rhubarb is of the get-there nature, and will grow itself to death if allowed, especially in the cellar; as a

plentiful supply of the roots is the principal factor in extensive growing, it pays to husband them very carefully.

Age of Roots for Forcing.—For profitable results, roots must be thrifty and strong (the larger the better), and not less than two or three years old.

Propagated roots, if well grown will be at their best from two to five years old; while those grown from seed need an additional year's growth. For reasons elsewhere mentioned too old roots are undesirable but of course may be used if no better can be obtained.

With large growers the root supply especially for the second season's work often becomes a serious problem; after that if rightly managed the trouble will be avoided.

It is not wise to force all the roots in sight the first year, lest the second year's work becomes a minus quantity.

To those engaging in the work, we say, plan for the future. Husband carefully and feed generously whatever roots you may have, look about among your neighbors and procure of them as many as they may be able to spare. The "Tug of War" is for the first and second year's supply, but with reasonable forethought the problem will work out in the years following.

Best Varieties.—Early Strawberry, Linnæus and Victoria are standard varieties, and will, I think, succeed wherever rhubarb will grow. The Victoria is considered best for forcing, but has the peculiarity of maturing its crop all at once. Whether this feature is advantageous or otherwise will depend on circumstances, and must be determined by the grower. It is however a great yielder and much sought after in the market. All varieties are good and succeed well under both open and

forced culture. Early Strawberry and Linnaeus are earlier than Victoria, which is an advantage, and prolong their season of bearing, a very desirable consideration if one is growing for home use only. The "Mammoth" while attaining great size, and second to no other known variety in flavor is green in color, and for that reason is undesirable for market purposes.

CHAPTER IV.

HOW TO SUCCEED.

IT is always well to remember that the small or medium crop is seldom or never the paying one. Growing two blades of grass where one has formerly grown must henceforth be the aim of the successful tiller of the soil. The up-to-date man courts neither failure nor even partial success, but success in its highest sense. To attain this goal *careful attention to details* is the only highway. A word of caution seems necessary here. While the work is exceedingly simple, study carefully the methods and keep well within the lines laid down. They have brought success, and experiments even though seemingly trifling, may prove costly.

Since introducing this method somewhat to the public, many reports of success have been returned to me. Failures too, and with the assurance that every detail had been carefully followed. Careful inquiry in every case however revealed some vital point overlooked or neglected (as failure to apply heat or some other equally glaring omission). When these were rectified, success was at once assured. *The mainspring of success is conditions just right.* Be satisfied with nothing less. One essential point which involves not only the safety but success of the crop is the arrangements for,

Heating.—Not only ample, but economical heat evenly distributed must be provided, and the expense of heating even in large cellars is comparatively small, if ordinary care is exercised in its application. Place your stoves and pipe, or whatever apparatus is used, low down. There will be no trouble in the heat ascending;

but the plants, and not the roof or rafters, are what require the heat. Plan then to apply the heat low down.

Heating Apparatus.—In Chapter I., the illustration showing a cellar with heat just started, shows plainly the method used there. In large cellars, two stoves placed at given distances from either end will give better results. In the house cellar 36 x 54 feet in size, described in the same chapter, no other heat than two large kerosene lamps was used. In my own house cellar 20 x 28 feet, I have been entirely successful with a two burner gasoline stove. Over one burner was placed an adjustable oven, to somewhat assist in radiation; and over the other burner a kettle of water. This arrangement answered to conserve both heat and moisture so that in a period of nearly three months, the plants were watered but once. It will often occur that a cellar otherwise nicely adapted for the work is not provided with a flue or smoke escape. In that case, use oil or gasoline stoves or large oil lamps.

In this connection let me mention still another fact, which will be of service. If, in preparing the cellar, due caution is observed to provide absolutely against frost, the cost of heating will amount to almost nothing. In building cellars then, expressly for the purpose, cover the sides above ground and the roof with manure, straw and earth or anything else at hand so that the temperature inside shall not vary with the changes of weather, and your heating problem is practically solved. House cellars may be thoroughly banked, and root cellars already built may be recovered, and so managed as to gain the desired results.

As to Temperature.—This matter may be entirely governed by circumstances. Rhubarb so adjusts itself to circumstances that changes of 30 to 50 degrees will not

injure it. Should your fires go entirely out in the coldest of weather no harm will be done provided the frost does not get in. The temperature may vary from 45 degrees to 80 or 90 degrees according to circumstances. The lower temperatures will of course, give a slower growth; with a darker color and perhaps a somewhat heavier yield. The higher temperature will in proportion give quicker returns and a lighter color. The question of yield under higher or lower temperature is as yet an open one, and not important as the variations would be but slight under any circumstances.

This range of temperature is perfectly safe, and broad enough that the crop can almost be held at will or hastened through for quick returns, as is desired.

Ventilation.—Fortunately the subject of ventilation requires little or no attention. But the fact must be emphasized to avoid trouble and worry. The truth is, that rhubarb forced in hotbeds banked in and covered over with boards and manure will thrive and grow at a surprising rate. In the cellars the change of air occasioned by going out and in for attention to the crop is entirely sufficient.

Light.—Daylight, even in small amounts, must be excluded. Admitting it while going out and in for attention to the crop will do no harm. The growing stalks will turn eagerly toward even a small ray of light, and if it is steadily admitted, will cause the stalks to dis-color and grow crooked, and wherever the light rests steadily the leaves will begin to grow, which by all means must be avoided. Artificial light unless too bright and long continued is not injurious. The blue light as from a gasoline stove does no harm; but in forcing even with kerosene lamps, I have demonstrated that the stalks in too close proximity to the lamps will be off in color, and

the leaves will open out to some extent and begin to grow green. Smoking the chimneys to subdue the light will entirely obviate the difficulty, and for small or even quite large cellars they are entirely practical.

Moisture.—The question of moisture will depend largely on the condition of the roots when placed in the cellar. If the clumps are well loaded with wet or moist soil when planted in, they will go through nicely with very little additional moisture. When the soil surrounding the roots is dry at the time of setting, water should be freely used when first starting the heat. A kettle of water kept on the stove is often all that is necessary to carry a crop entirely through. Ordinarily the use of water (preferably tepid), to some extent is advisable; but many fine crops are matured without additional moisture except the use of a kettle as above mentioned. The whole matter, however, is easily determined by ordinary judgment. If needed, apply at any time except just previous to picking, as watering then would make bad work in gathering the crop.

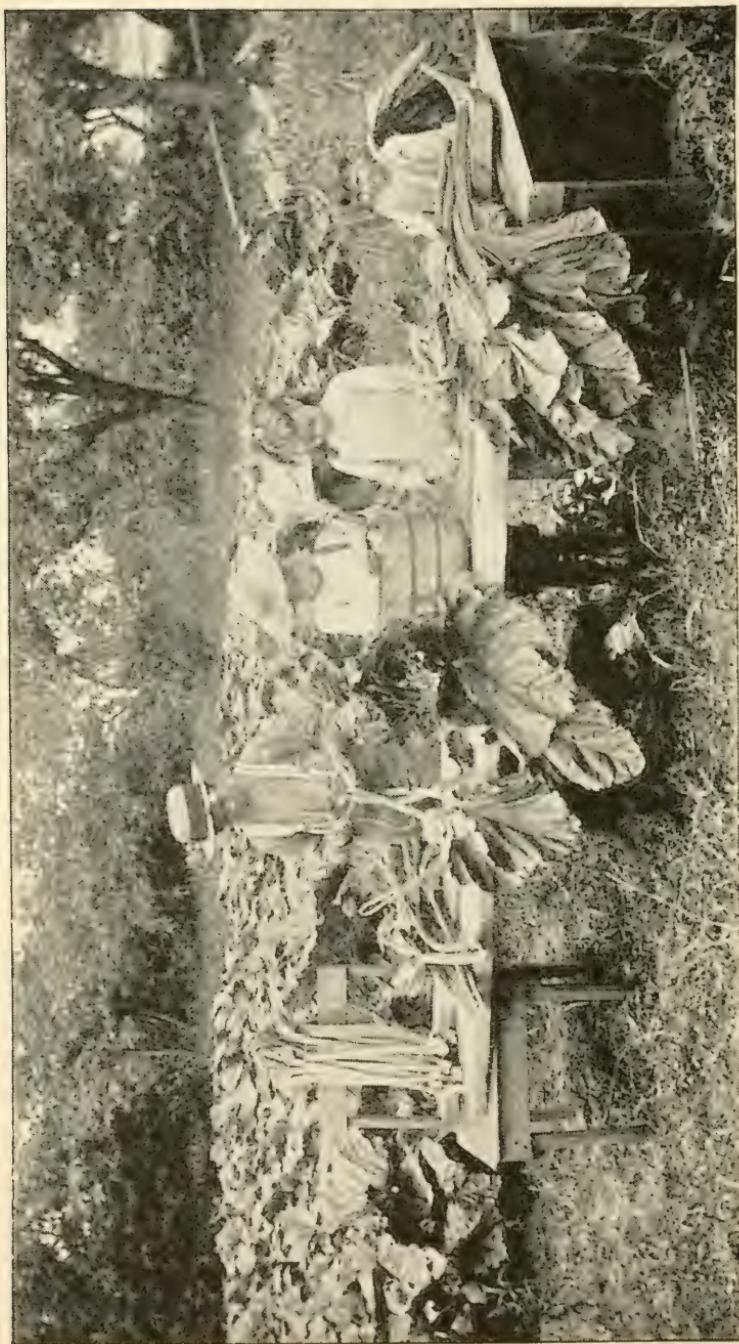
Fertilizing.—The work of fertilizing is far more easily done in the field; but in case roots are used that have not been well cared for, then good results are obtained by applying a fertilizer in the cellar.

The writer has had good results with "air-slacked" lime applied to the clumps before growth began, at the rate of a small tablespoonful to each plant. Also nitrate of soda and water in the proportion of an ounce to the gallon, sprinkled on, brings good results. Liquid cow manure will also well repay the cost of application. Extensive growers have reported very gratifying results by mixing cow and horse manure to the consistency of batter and pouring over the entire surface of the plants as soon as set. No doubt this will send the crop; but

would, I think, be objectionable in the house cellar. It is recommended however, for growers to try the various suggestions, and results will determine the most advantageous method to pursue.

Thinning Out.—It sometime occurs that numerous small stalks spring up that will never grow to any size. This may come from low vitality of the roots. In this case, thin out useless stalks and apply liquid cow manure liberally. It is more often occasioned by insufficient, or poorly distributed heat. Cases of this kind have been called to my attention where hundreds of stalks not larger than a small lead pencil were springing up, and very few if any large stalks. Every detail of the work had been carefully attended to except the matter of heat, that had not been applied. The difficulty was that the cellar was naturally a little too warm for the roots to lie dormant, but was not warm enough to give any impetus to the growth. Directions were given to turn on heat, and in three weeks a nice picking was ready for the market. The small stalks should be thinned wherever they appear as before stated.

Precautionary Measures.—To guard against insects which more or less congregate in such places, and if not injurious to the rhubarb nevertheless become a nuisance, the cellars should be renovated both before and after the forcing season. Fumigate with sulphur, keeping the cellar tightly closed for at least twelve hours, after which whitewash walls and ceiling with common whitewash, adding sulphate of copper (blue vitriol or blue stone) in the proportion of one ounce to the gallon, or with crude carbolic acid in same proportion. If the walls are too roughly constructed to admit of whitewashing, spray with Bordeaux mixture full strength, omitting the arsenites, but adding the carbolic acid in same proportions as above.



PREPARING FOR MARKET.

CHAPTER V.

HANDLING THE CROP.

Time of Maturing.—This of course will depend on the temperature maintained, also on the variety. The Victoria will require more time than the earlier sorts previously mentioned. From three to eight weeks will be required to mature the first picking, and the season will continue from three to four weeks or even longer: depending on the vigor of the roots and also the degree of heat used.

Usually 12 to 14 inches high is good height for picking: but even less height is often admissible owing to size and development. Where the product is sold by the pound regardless of height or size there is no objection to letting it remain until fully grown, unless a declining market should necessitate haste in gathering. Here at Detroit essentially the birthplace and home of the industry, all transactions are reckoned by the dozen. When thus sold, self interest at least, would dictate selling as rapidly as reasonable height was attained, and thus husband the vitality of the roots for the remainder of the crop. However it must not be left too long under any circumstances, as the stalks grow spongy after a time, and falling down, become worthless. Experience will soon enable any one to properly judge of these matters.

Gathering the Crop.—This may seem a trivial point;

but unless carefully done will result in much waste of stalks already fit for the market, and damage to the young and tender shoots as well. The clumps themselves are liable also to injury from careless pulling or jerking. The stalks are exceedingly tender and brittle, and the attempt to pull them off will result in breaking them off at half length, or just above the ground, which spoils the looks of, and shortens the stalks by whatever length remains on the clumps or crowns.

With the right hand carefully grasp the stalk well down to the ground, allowing the index finger to lie flat against the inner side of the stalk. Push the finger downward between the stalk and clump to where they unite, then pry and pull in the same motion, and the stalk will come off two or three inches below the surface of the ground.

Tying Up.—The illustration “Preparing for Market,” shows the work in operation, which may be done by the children after a little showing. The work here shown is with the out door grown: when after the bundle is tied the leaves are nearly all removed with the knife. The method for the dark forced is the same except, what little leaf there is, should be left on, with its beautiful lemon color adding much to the appearance of the bunch. Gather up the stalks and remove to a convenient place for the work. Remove the hulls as shown in illustration, and if intended for local trade wash off the adhering soil or filth. If for shipping do not wash, as the water remaining on the stalk will be injurious; but use a brush or small broom instead. In bunching, average up the stalks as much as possible putting large and small together. The stalks are tied around the butts with ordinary bunching twine, three in a bunch, or sometimes four, if too small. Twelve bunches are put into a bundle



ON THE DISPLAY STAND IN A DETROIT COMMISSION HOUSE.

and tied around both butts and tops. These bunches are called dozens but really contain 36 stalks. The bundles are put up in this way solely for convenience in the retail trade, the grocers opening up the bundles and selling out by the bunch.

Different markets, of course, will require different packages; and the growers must be governed by the demands of their respective markets. In putting up for the market, imagine yourself the buyer and put up only such as you would be willing to buy and pay for. Let your trade mark be your customer's guarantee for honest goods, and the market will always seek you.

Marketing.—Many growers depend entirely on the local markets, supplying hotels, restaurants, retail grocers and private families. Others dispose of the crop through the commission merchants, while still others ship direct to dealers in distant cities.

For shipping, the bundles are wrapped in paper and boxed, the boxes holding from four bunches upward, according to size of orders.

As the rhubarb would be entirely ruined if frozen during shipment, it is usually shipped by express, and although rates are ruinously high, the product finds its way to nearly all the principal cities of the United States.

CHAPTER VI.

FERTILIZERS.

Light or Thin Soils.—As elsewhere referred to, light sandy or gravelly soils require special treatment, or if naturally lacking in essential elements they must be supplied.

To supply them in abundance and in the cheapest possible manner, should be the study of every intelligent tiller of the soil.

In the soils above mentioned one property very liable to be conspicuous on account of its absence is

Humus.—As ordinarily understood this is simply decayed vegetable matter, and while indispensable to the best results for all crops, is especially so for rhubarb. Clover, (red or crimson) cow-peas and like crops, according to localities where each, or any of them succeed, will furnish this element in abundance. But the nature of these crops implies the necessity of preparation and rotation previous to growing the rhubarb crop.

Successful crops in any soil will necessitate these, or kindred helps; but more especially in the lighter soils.

Barn-yard Manure.—Doubtless the best all round fertilizer for all soils and conditions is the ever ready-for-business barn-yard manure. It also has the advantage that it may be applied for plowing under when fitting the ground for the immediate crop, or afterward as a top dressing. But whatever the base for the humus, or however applied, let it be without stint. If possible, I would write the legend, "Feed Me," on every fence corner surrounding the rhubarb field.

Binders.—A serious lack in all the lighter soils is adhesion; a something, so to speak, which will bind and hold together the particles of soil, rendering them, as a whole, less sensitive to the action of heat and drought.

The agencies best adapted to this work, some of which, at least, if not all, are within the reach of every one, are air-slacked lime, wood ashes, either leached or unleached, swamp muck and marl. These applied in large amounts, preferably as a top dressing to be worked into the soil will many times repay the cost and labor of applying. Any and all are valuable, and are of course more easily and economically applied before the plants are set out. Old fields will also be much renovated and improved, by some of the above applications; lime especially.

Acidity of Soil.—This subject is so generally overlooked by farmers and gardeners that the opportunity of drilling in a little deeper and driving it home a little harder, should not be lost.

By careful experiments and observation, I am led to believe that many soils otherwise fertile and valuable, are losing half their usefulness from no other cause than their acidity; and when so easily remedied the wonder is, that they are so sorely neglected. The trouble is prevalent in almost every variety and condition of soil, and its detection is so simple that we give it in brief as also, the remedy. Procure from any druggist a piece of blue litmus paper, taking care that it never comes in contact with water or becomes damp previous to using. Thoroughly moisten some of the soil to be tested and with a knife or other thin blade make an incision. Insert the paper closing back the soil against it, and leave for a few minutes, after which withdraw it and rinse in clear water. The condition of the soil either acid or



NO NITRATE.

RHUBARB.

650 LBS. NITRATE OF SODA IN 3 APPLICATIONS.

otherwise will be determined by the paper. If highly discolored and of a dark purple hue, rest assured that the soil requires lime and plenty of it. Less discoloration will indicate less acidity, and consequently less lime. From five hundred to two thousand pounds of air-slacked lime per acre applied to the surface of, and thoroughly worked into the soil will remedy the trouble, and in many cases double the crop. The lime while not of itself essentially a fertilizer unlocks the plant food in the soil and places it in condition to be assimilated by the plant. Wood ashes either leached or unleached will also remedy the difficulty, though not as quickly or thoroughly as will the lime. The action of some other fertilizers is also greatly increased by the previous use of the lime, and notably

Nitrate of Soda.—By courtesy of Dr. John A. Myers of New York, under whose supervision extensive experiments with Nitrate of Soda have been made, we insert an illustration showing its effects upon rhubarb.

Following are the remarks of Mr. R. M. Winans, who made the fertilizer experiments.

“The succulent, watery stalks of the Rhubarb, or Pie Plant, are most highly developed by large supplies of nitrogenous manures. Heavy applications of Nitrate of Soda early in the spring, before nitrification begins in the soil and at the time that the Rhubarb most needs a supply of nitrogen, will give the grower a very large return for the money invested.

“There being no established field of Rhubarb at hand, our experiment was necessarily confined to plants or crowns set this spring. At the time of setting, an application of Nitrate of Soda, at the rate of 150 pounds per acre, was given to the crowns. Later, when growth began, two applications were made, first, at the rate of

200 pounds, and, second, at 300 pounds per acre. The soda was scattered about the plants by hand and hoed into the soil close to the roots. They thus received a total application of 650 pounds per acre in three applications.

"With old established bearing plants larger quantities should be applied at the first opening of Spring.

"The result of this experiment is best shown by the accompanying photograph of one treated and one untreated plant standing side by side."

Nitrogen is what the crop is hungry for in the early Spring; and generally speaking there is perhaps, nothing that will so nearly meet the requirements as the application of nitrate of soda.

It is a well established fact that however much barn-yard manure may have been applied, the process of nitrification takes place very slowly, until the ground is thoroughly warmed by the action of the sun's rays.

In growing the out door product for market, the early crop is always the paying one and the more quickly it can be grown the better will be the quality and the less the competition from the small fruits that follow its season so closely.

Jadoo Fibre.—Too much emphasis cannot well be laid on the promotion of root growth. Vitally important to the successful culture of all plant and vegetable life, it becomes doubly so to rhubarb. The forcing process is at best very exhausting, and the roots came out of the cellar with vitality much impaired. Necessarily then, they require special feeding and care to overcome the strain and recover vigor and size for future bearing as quickly as possible.

The same general principle applies equally to propagating from unforced roots and also growing from the

seed. In a comparatively wide range of experiments with special fertilizers I have found nothing else so fully meeting the requirements of a healthy well-developed growth as "Jadoo."

How to Use.—Before using, the fibre should be fined by working through a sieve with mesh not exceeding an inch. When transplanting place a handful of the fibre underneath and around the roots, covering with soil and firming afterward.

In sowing the seed, open the drill sufficiently to sprinkle the fibre along the bottom. Sow on the seed, covering all with soil.

In transplanting, use the fibre each time the plants are reset, the same as with propagated roots.

Unfortunately no illustration is at hand from which a comparison of treated and untreated plants may be drawn. The simple test however, is within reach of every grower by following directions given above, and in "proving all things holding fast to that which is good" the highest objects in life are attained.

CHAPTER VII.

CULTURE.

Soil.—As the cultivation is the same for all methods of growing, no distinctions will be made. The ideal home or soil for rhubarb is a heavy sandy or clay loam, naturally cool and moist, yet having good drainage. As all do not possess these natural advantages it remains for each one to “make circumstances” and so prepare the soil whatever kind it may be that the highest possible results may be realized.

Preparation.—Heavy soils should be worked deeply, subsoiling in clay if possible. Light sandy or gravelly soil, less deeply, leaving the foundation more firm to better hold the moisture. In any case, fertilize without stint. Rhubarb is a gross feeder and there is little danger of over feeding. The lighter soils at least, will be much benefited by liberal applications of swamp muck, lime and ashes either leached or unleached, all tending to hold or bind the soil together, thus minimizing the tendency to burn or dry out. It will be useless to hope for, or expect success in its highest sense at least, on ground only moderately fertilized or half tilled.

Propagation.—To those engaging in the work, either for the out door growing of the Summer crop or for Winter forcing, the effort should be to get a stock of thrifty, vigorous roots in the shortest possible time. This result will be gained by propagation provided a stock of old roots are at hand from which to propagate.

The work should be done with a sharp spade or long heavy bladed knife. The clumps owing to size, are divided into two, three or more sections, taking care

not to disturb the crowns or eyes, and making sure that each section has one or more eyes. Trim up nicely, carefully removing all broken or mangled portions of the roots, leaving of course, as much root as possible.

Unforced Roots.—When propagating from roots that have not been forced, the best results will be obtained by digging out late in the Fall and removing to some shed, or otherwise slightly protecting, and allow them to freeze out through the Winter. The results of the freezing will be more than satisfactory. However, they will succeed nicely if left in the ground until time for transplanting which should be done as early in Spring as weather and ground will permit.

Forced Roots.—As some controversy has arisen over propagating from the forced roots, it is well to state that when properly handled they are perfectly safe for propagating, and valuable in keeping up the root supply, and whatever professedly wise men may say of their uselessness, and “throwing them on the manure heap,” should be passed by as idle talk. Simply, when forcing, give the roots a chance for their lives, and when they begin to decline, stop the growth by removing from the cellar to a shed, or otherwise slightly protect them from too severe changes, until time for transplanting.

Divide and otherwise treat them just the same as unforced roots and they will again be ready for forcing in from two to three years. The Writer has seen as fine roots as could be desired dug out the second year after transplanting.

All propagated roots should be planted into permanent rows four to five feet apart, and the ground between the rows may be used for catch crops the first year.

Plants for setting.—These may be obtained from any of the reliable seed or nursery men; and will well

repay the cost. Time is money, in getting established in the work, and they will save from one to two years' time over plants from the seed.

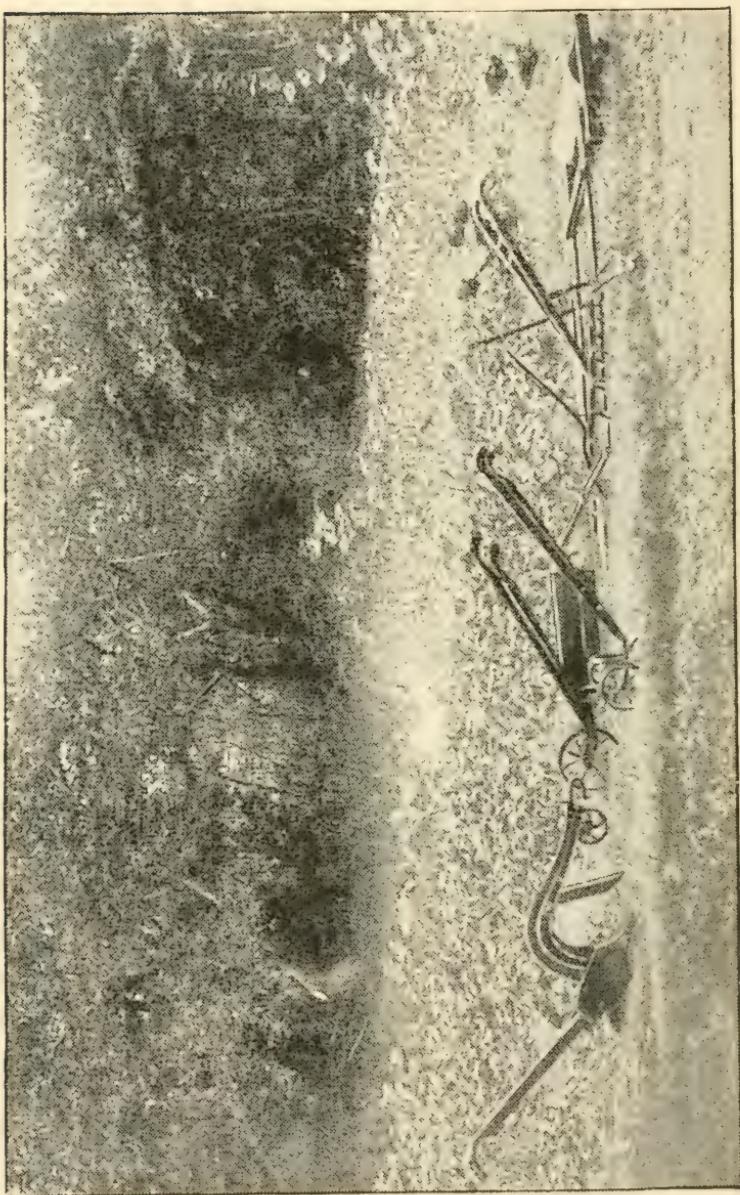
Growing from the Seed.—This is also recommended in addition to the work of propagating. However, one point must not be lost sight of, rhubarb seed with one exception, cannot be relied upon to reproduce its own. Myatt's Victoria is the exception and has become so thoroughly established in its type that it nearly always comes true to name. Hence to sow seed from any and all varieties, at hand would be unsafe (except for experimental purposes) and liable to result in serious loss of time. Experiments however, are always in order and many times very useful; as many valuable varieties are thus discovered and added to the list of both fruit and vegetables.

The seed is sown in hotbeds early in the Spring, in drills four to six inches apart, or in the open ground as early as weather will permit in rows 12 or 15 inches apart. When the plants are well up and somewhat established, thin to three or four inches in the row. When six to eight weeks old transplant 12 to 15 inches apart in the rows. If sown in the open ground, thin out the rows to the proper distance using the plants thus removed for other rows.

The work of transplanting will be greatly simplified by opening the rows with the plow, turning a shallow furrow for the plants, and deeper, according to size, for propagating roots.

Thorough tillage must be kept up the entire season through to give all the growth possible. The following Spring, transplant into permanent rows four to five feet apart.

Tillage.—Remember that the largest possible growth



TOOLS USED IN RHUBARB CULTURE.

is the object sought ; it follows, then, that tillage must be thorough and constant. It will be essentially the same whether propagated, grown from plants or from seed. The ground should be covered with a heavy coat of manure in the Fall, and in the Spring it should be cultivated in. As soon as the frost is out sufficiently, fork the ground thoroughly along the rows and in the hills, letting in the sunshine and giving the plants an early start.

Note 1.—No stalks should be picked the first season ; and none should ever be allowed to go to seed, as it is very exhausting. After the first year the stalks can be pulled for the market but should not be drawn upon too heavily, especially if designed for forcing in the Winter.

During the bearing season, the cultivation of course has to be discontinued, on account of interfering with the crop. Hence then, the great importance of thorough work while it can be done. As soon as the bearing season is over cultivation should again begin, especially if the roots are to be forced during the Winter. The heavy draft upon the plants during the bearing season together with the hot dry weather often prevalent during the whole after season, all tend to weaken and impair the vitality. Thorough cultivation at this time is highly necessary to stimulate the roots and to destroy the grass and weeds which would otherwise absorb the moisture and plant food which the roots so much require.

If Winter forcing is to follow, a heavy application of barnyard manure should be applied along the rows. If to remain standing for the following year, the manure need not be applied until later, say after the ground freezes when it should be applied sufficiently heavy to well cover the entire surface.

CHAPTER VIII.

COMPARISON OF OLD AND NEW METHODS.

Criticisms Answered.—A brief outline of the New Culture published in the *Rural New Yorker* of 1898 furnished the text for criticisms by some of the Eastern growers, especially in the vicinity of Boston where the old glass method of field forcing is still in vogue.

Judgment was hastily passed, and the New Culture was sent to the rear, as being too expensive for the slight advance in price and the limited demand for the product. Answering the criticisms in a later issue of the same paper it was shown that the expense of the old method for forcing upon the scale carried on in the West would be beyond the reach of the ordinary gardener. As to prices and demand, large quantities were grown here at highly remunerative prices and sold in nearly all the large Eastern cities, Boston included, with express and commission men's charges added.

The Old Method.—As practiced in the East, the old method consists simply of constructing a rough board shed over the plants as they grow in the field. The shed is three or four feet high on the front side and one foot higher at the back to give the slope for the glass. The ends are boarded up and the sash are put on resting upon the rafters. No heat is used other than the sunlight which the glass conserves. The forcing usually begins the latter part of February or first of March. The roots are not lifted but remain in the rows four to five feet apart, and to force in quantities would require glass by the acre. The same method was former-

ly practiced by Western growers, except that to economize in glass, the roots were dug out and placed in hot-bed boxes. It is a back number here, however, for many reasons.

First, the color and quality by the New Culture are vastly superior to that grown under glass, second, the old method can hasten the crop but a few days at best, whereas tons of it can be grown in the cellars before the glass out in the field could have the least possible effect. Third, the dark forcing gives very little leaf, never opening out on a large portion of the stalks. Grown under glass, most of the strength is lost in the leaf which grows rank and green.

By the new method, rhubarb, and a finer quality than was ever grown in the field or under glass, may be grown for home use or market from the middle of December to April.

Growing in Greenhouse.—This method is essentially the same in detail, though not in results, as the new culture. The labor of lifting and setting the roots would be the same. The season under either would be practically the same. At this point the methods part company and the results of the new culture by practical demonstrations are clearly shown to be far and away ahead of the old, first as to,

Quality.—No method of culture, either outdoor or forced, where light is used has ever produced an article equal to the dark forced. The color, quality, and absence of leaf are all in favor of the new culture; and in so far as tested for that particular point the yield is also greater. And as to,

Adaptability.—Greenhouse culture would of necessity be limited to a very few growers, and they the lucky possessors of a greenhouse. In the New Culture, the

field is the world, applicable to all from the extensive farmer down through the various grades to the owner or renter of a city or village house and lot. The enterprise has come to stay, and the growers by this method will be the harvesters, while the followers of the old methods will, of necessity, be merely the gleaners.

CHAPTER IX.

FUTURE OUTLOOK.

THE magnitude of the forcing industry, as elsewhere referred to, has reached a limit heretofore unthought of, but as we firmly believe, it is yet in its infancy. Yet with all its magnitude the dwellers in the rural districts are practically shut out of its benefits. True, the farmer on his periodical trips to the village or city market can buy these products provided his entire load of produce will sell for enough to buy these delicacies, sufficient for a meal or two. It is refreshing and pleasant to know that this one industry is brought right to the farmer's door, and by its cheapness and simplicity, one product of the forcing industry, and that the most delicious yet produced may be enjoyed by every farmer and his family as the fruit of his own labor. While this is the fact nevertheless comparatively few will undertake it for they will all begin "with one accord to make excuses."

While entirely practicable and feasible for nearly all classes, and especially farmers and gardeners to supply themselves with this luxury from January to May, it would be entirely impracticable for all to engage in the work as a business. Individual circumstances and surroundings must be carefully studied, as access to markets, facilities for maintaining the root supply and many other features.

A headlong plunge into the work as "the horse rusheth into the battle," would to many mean failure. Here in Detroit, essentially its home and birthplace as

an established enterprise, thousands of dollars are paid the gardeners every winter for the product. Tons are consumed here and tons are shipped away, reaching nearly all the principal cities of the United States. Yet comparatively few of the farmers or gardeners are engaged in the work. Scores and hundreds of the people here never heard of the enterprise and themselves, probably, never tasted the product. Yet the enterprise is growing, and the work is extending, and ere long the growing of the roots for forcing will be a business of itself.

The Demand.—Within the recollection of many not old enough to be very near relatives of Adam, tomato growing has grown to marvelous proportions; but the demand for tomatoes had to be created. The demand will have to be made for winter rhubarb.

But this is only history repeated. Figuratively speaking the luxuries of yesterday become the necessities of to-day, and once having tested the qualities of this new delicacy its merits will fully establish its necessity; and the men who grow it and help to build up that demand, will get in on the first floor and make the money.

The growers here are often unable to obtain what roots they need for immediate use and are ready to pay a fair price, \$10 per 100, and do their own hauling for thrifty forcing roots. They can be profitably grown at that price, as the ground for the first year after transplanting can be advantageously used for catch crops and the second year should yield sufficient rhubarb to pay all expenses of caring for the crop.

Thus the outlook seems encouraging from any stand-point. Competition, for the present at least, will be chiefly confined to localities north of say 38 degrees, and

while localities south of that should become valuable markets for the product, the production of the crop could not be depended upon except through acclimating the plants elsewhere referred to.

CHAPTER X.

Extracts from Bulletin No. 55, 1899..

Rhode Island Experiment Station.

In the *Rural New Yorker* for 1898, page 736, appeared a brief note calling attention to the fact that rhubarb may be forced in the dark in any ordinary frost-proof cellar or out-building. Not knowing of the excellent articles which were to follow, the subject was thought to offer an interesting field for further inquiry. Some simple experiments were therefore begun, to test the feasibility of thus growing it.

Plants from the college garden were thrown out of the earth December 6th, before the ground had frozen. Six of these were transferred to the greenhouse at once. Three were placed on a bench next the eaves, which, though not the lightest part of the house, gave them practically full sunlight. The other three were placed underneath a bench with sides and ends closely boarded, to keep them in darkness. December 17th, after the plants in the field had been thoroughly frozen, additional ones were brought in and placed beside the first in the two positions above mentioned.

On January 6th, it was noted that the plants brought in at first, without freezing, although having been in the house longer than the others, were far behind them in activity. Those on the benches, exposed to full light, had barely begun growth, one being almost dormant. Of those brought in after freezing, the ones on the bench were making considerable growth, there being many



PRODUCT OF FROZEN AND UNFROZEN ROOTS.

stalks three to four inches long, with leaves unfolding. In darkness, the plants brought in without freezing were making a little growth, while those which had first been frozen had sprung into rapid growth, there being many excellent, vigorous stalks, some of them 12 to 20 inches long. On these but very little leaf had developed, almost the entire growth being made up of stalk. Some plants had thrown up many small and weak shoots, while others threw up fewer, but more vigorous and desirable ones. The difference between the frozen and unfrozen plants was surprising, the unfrozen ones having produced but few stalks and only one to three inches long. Although the house in which they were grown is run at a very low temperature, for lettuce, this position underneath the bench near the pipes was a close and warm one.

January 9th, five large plants and three small ones were placed in the cellar of a dwelling house, in a corner where light could be practically shut off. A furnace stands in the cellar about 15 feet from where the plants were placed. The cellar is a very large one and the temperature in it probably ranges about the same as that of an ordinary cellar without a furnace. At the time the crop was being harvested it ran about 40 degrees, Fahrenheit. Water stands in parts of the cellar and the ground upon which the plants were placed was wet and muddy. At the same time large roots were placed under the greenhouse bench beside those put in early. All these roots had lain on top of the ground, subjected to repeated freezing and thawing, rain and snow, for more than a month. It seemed probable that they would be much weakened thereby.

On January 10th, the best stalks from each lot placed in the greenhouse December 8th, and 17th, were pulled and photographed. The product from frozen plants

grown in darkness proved to be exceptionally fine, the color at base being bright cherry and varying to light pink toward the tip, the extreme upper end approaching straw color, the leaf being lemon yellow. The stalks grown in daylight varied from sultan to maroon color, with tinges of green on the flat side toward the leaf, the leaf itself being dark new green. None of the product from that brought in without freezing, and none from the frozen plants grown in daylight, was suitable for gathering at this date, but the best of it was taken for comparison. Of that grown in darkness, from frozen plants, only those stalks which had made as good growth as they were likely to make were gathered, and but three of these appear in the photograph. Some stalks were longer than those shown.

On January 19th, the plants brought in on the 9th, were observed to be starting into growth nicely, many stalks being three to four inches long. The ones placed in the dwelling-house cellar showed no activity. These latter had only pushed slightly above the soil on January 30th, and gave their first product March 11th.

By the middle of February those plants first brought in had begun to decline, the stalks being small and slender. They were apparently nearly past their usefulness. All those growing under the bench were taken out February 27th; those placed on the bench were removed March 6th, and the ones brought in in January were taken from under the bench March 17th.

The total yields obtained are as follows:—

	Total. lbs. oz.	Av. per plant. lbs. oz.
Plants brought in Dec. 8th, not frozen,		
No. 1, 3 plants, grown in the light,	1 $\frac{1}{4}$	$\frac{5}{8}$
No. 2, 3 plants, grown in darkness,	5 5 $\frac{1}{4}$	1 12 $\frac{5}{8}$

	Total. lbs.	Total. oz.	Avg. per plant, lbs.	Avg. per plant, oz.
Plants brought in Dec. 17th, frozen,				
No. 3, 9 plants, grown in the light,	41	1	4	9
No. 4, 7 plants, grown in darkness,	43	7½	6	1 $\frac{5}{8}$
Plants brought in Jan. 9th, repeatedly frozen,				
No. 5, 8 plants, greenhouse darkness,	41	5½	5	2 $\frac{1}{8}$
No. 6, 8 plants (5 large 3 small), cool cellar, dark,	107		13	6

Too much dependence must not be placed on these yields. Plants taken from the college garden were used, the variety being unknown. They may, or may not have yielded as well as plants should. The conditions were not such as to warrant drawing definite conclusions concerning comparative yields, but they *do* show very clearly the necessity of allowing plants to freeze before attempting to force them. They also seem to show some advantage in yield in favor of plants grown in darkness rather than in light. But the most striking difference is shown in the greater yield from plants grown in the dwelling-house cellar, as compared with those grown under greenhouse benches.

As to the length of time required after bringing the plants in from the field, it may be said that in the above lots, No. 1, unfrozen, grown in the light, yielded practically nothing at any time. No. 2, unfrozen, grown in darkness, yielded the bulk of its crop more than two months after being placed in position. No. 3, frozen, grown in light, gave its first large picking eight weeks after being brought in and the second two weeks later, the bulk having been taken at these two times. No. 4, frozen, grown in *darkness*, yielded several pounds 17 days after being brought in and the bulk, within the next two weeks, but continued to yield something for a period of six weeks. No. 5 yielded one pound per plant three

weeks from the time it was brought in, giving its heaviest yield at the end of six weeks and a good yield at eight weeks.

No. 6, placed in a cool cellar, gave its first product a little more than two months after being placed there. This lot continued to produce for two months. The effect of temperature and of freezing on the time of maturity is fully shown, but not the influence of light, for while No. 3 was much slower in yielding its return than No. 4, brought in at the same time, the temperature underneath the bench, where No. 4 was grown, was much higher than the bench, where No. 3 was grown.

To test the cooking qualities of the product grown in darkness as compared with that grown in light, samples of each were cooked separately, as nearly alike as possible, and placed on the table together. If properly cooked, that grown in darkness makes a more attractive sauce than that grown in the light, preserving much of the same clear, bright color seen in the fresh stalks. The product grown in the light makes a darker sauce, tending toward a dull, greenish unattractive color. Its flavor, on the other hand, seems to be somewhat more pronounced, perhaps a little richer, and would doubtless be preferred by some. The flavor of the two products is not alike, and the question of preference, would depend chiefly upon the individual. The attractiveness of sauce or pies made from the product depends chiefly upon the method of cooking and the external color of the stalks, it being unnecessary to remove the skin in either case. This color of the stalk is in turn dependent upon the conditions under which it is grown. In general, the higher the temperature, the lighter will be the color.

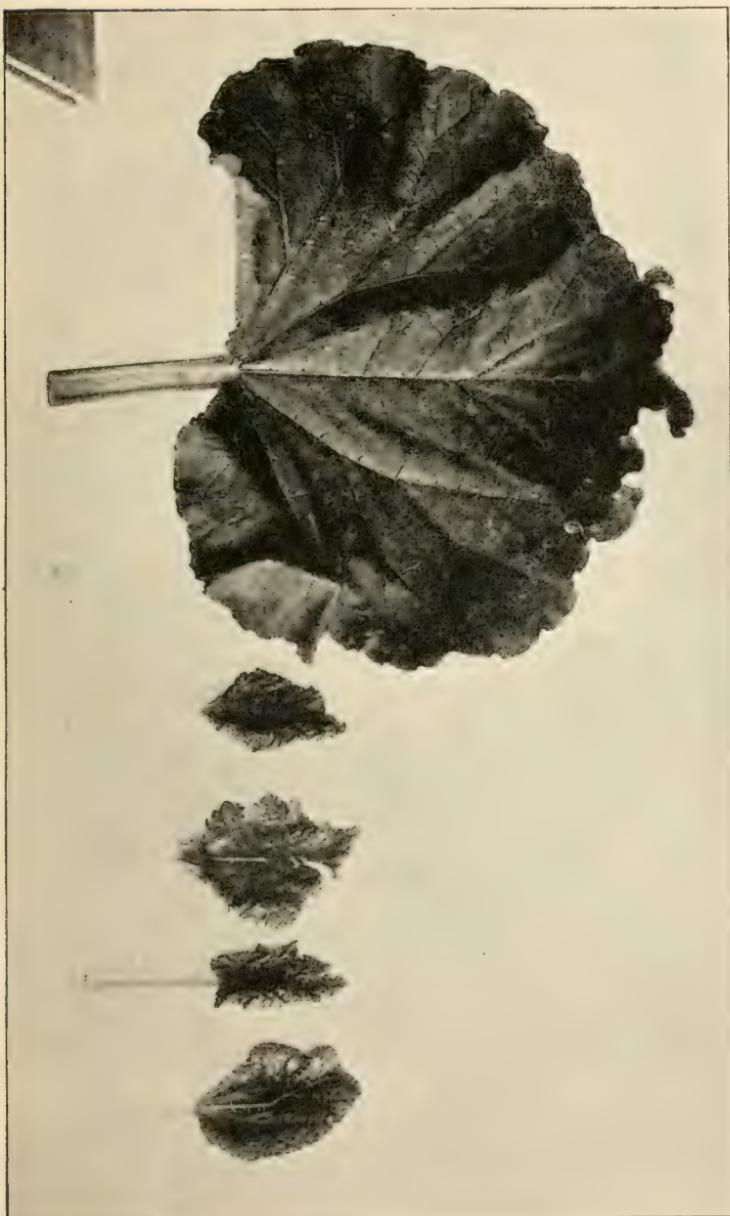
That taken from the cooler dwelling-house cellar was much brighter and more highly colored than that

grown in the warmer position beneath the greenhouse bench. Stalks growing in the light also vary in color, owing doubtless to individual characteristics of the plants as well as to differences in the condition of light and heat. The color is best preserved in cooking by placing the product over the fire in cold water and allowing it to heat gradually. Hot water applied at first extracts much of the color.

* * * A comparison between the normal leaf development of light-grown and dark-grown stalks is shown in the illustration "Leaf Development in Light and in Darkness." The product grown in darkness is far more attractive than that grown in the light; if not forced too hard it possesses a bright cherry or ox-blood color, and the leaf is very small. That grown in daylight possesses a darker and duller color somewhat mixed with green, and the leaf is large, as when grown in the open air. The contrast in leaf development, both in size and color, is very striking. The waste product is, in the one case, large, in the other almost nothing.

SUMMARY.

* * * Summing up these fragments, I wish to impress upon every one who has a garden with rhubarb in it, the fact that he and his family may be enjoying in February and March of next year, a more beautiful product than *ever* grows in the open ground. To do it he will need to transfer a few roots to a dark corner of the cellar after they have frozen in the fall, packing a little fine mellow earth about them, and then simply see that the plants are kept moist. Whoever owns a garden with no rhubarb in it, should see that some is



LEAF DEVELOPMENT IN LIGHT AND IN DARKNESS.

planted there forthwith. A warm cellar will hasten the crop; but a moderately cool one, will give a finer product and probably a better yield. The length of time between planting and harvesting varies from less than three weeks to more than two months, depending chiefly upon the temperature. Allowing the roots to freeze in the field will greatly facilitate forcing. Large roots should yield five to 10 pounds per plant; and every 10 ounces of that yield will make a delicious pie.

Note.—It is with no small degree of pleasure and satisfaction that we append the above bulletin almost entire. Kingston was, I think, the first experiment station to take up and verify the work as previously exemplified by myself. The encouragement thus given this new industry will be of vast importance to the people at large not only as producers, but also to the consumers of the product.

AUTHOR.

CHAPTER XI.

HOW TO USE RHUBARB.

For Dessert.

Rhubarb Pies.—To ordinary pie crust (which is made with a teacupful of shortening to three teacupfuls flour, and three-fourths teacupful very cold water) add half teaspoonful salt and one teaspoonful baking powder. Sift the salt and powder with the flour, add to this the shortening, blend it with a knife and lastly add the water—ice water is best. Use the hand as little as possible in the mixing so as to keep the paste cool. At once roll out, fill and bake. For berry, pumpkin, or any juicy pies the baking powder makes a dryer crust as it prevents the ready absorption of the juices as in ordinary pie crust.

Rhubarb Pie No. 1.—Stir into two cupfuls of rather finely chopped rhubarb, a cupful of sugar with which a tablespoonful of flour has been thoroughly mixed; then add a beaten egg and arrange in a pie-plate with two crusts. Let the oven be hot at first that the crust may be properly baked, after which cool the oven to moderation and take the pie out when it has baked 30 minutes altogether. Rhubarb pie, like all pastry, is best the day it is made.

Rhubarb Pie No. 2.—Two cups of chopped rhubarb, one and one-quarter cups sugar. Put in shallow saucepan with one-fourth cup of water and cook very fast. When cold, line a pie plate with paste, wet the rim, add the rhubarb and lay three or four bars of paste

across, forming diamond-shaped spaces, put a rim about the pie, wash over with the beaten yolk of an egg and bake in a quick oven 15 minutes.

Rhubarb Pie No. 3.—Beat one egg with three-fourths cupful of sugar and a tablespoonful of flour. To this add a cupful of rhubarb chopped or cut fine. Bake with one crust. When done, cover the pie with the beaten white of an egg, sweeten to taste, and let it brown in the oven.

Rhubarb Pie No. 4.—Over three cups of finely chopped rhubarb pour cold water, let stand 10 minutes, then drain; mix two tablespoonfuls of flour with one and a half cups of sugar, the yolks of two eggs and a heaping tablespoonful of butter, beat well, then add four tablespoonfuls of water, and the rhubarb. Stir all together and bake with a lower crust only. When done make a frosting with the whites of the eggs and six tablespoonfuls of sugar, spread over the top of the pies and return to the oven to brown. This amount will make two pies.

Pie Plant Charlotte.—Wash and cut pie plant in small pieces, cover the bottom of a pudding dish with a layer of pie plant and sugar, then a layer of bread crumbs and bits of butter, and so on until the dish is full, having the crumbs on top. Bake half an hour in a moderate oven. Allow a pound of sugar to a pound of fruit.

Pie Plant Pudding.—Cover the bottom of a pudding dish to the depth of one and one half inches with pie plant cut in fine pieces, and a very liberal allowance of sugar. Make a rich batter of one cup of thick sour cream, one teaspoonful soda, one of salt (both level full), and flour enough to make a stiff batter. Pour this over the pie plant and bake one-half hour, or steam three-

quarters hour. When done, turn bottom side up on a large plate and spread with butter and sugar; or cover with thick sweet cream and sugar with a little nutmeg grated over the top.

Emergency Pudding.—Place a thick slice of fresh bread (from which the crust has been removed), upon a fancy dessert plate, cover the bread thickly with stewed and well sweetened rhubarb, add a generous layer of sugar, grate a little nutmeg over it and pour thick sweet cream over all and serve immediately. Prepare as many plates as there are people to serve.

Pick-up Pudding.—Cover slices of stale sponge cake thickly with stewed rhubarb well sweetened; cover with whipped cream and dust powdered sugar over the top.

Best of all Pudding.—One tablespoonful butter, one cup sugar, one egg well beaten, one pint flour, two teaspoonfuls baking powder, one cup sweet milk, beat well and bake in two deep pie tins. As soon as done remove from oven, cover with pie plant marmalade and this in turn with the white of an egg and three tablespoonfuls of sugar whipped to a stiff froth, return to the oven to brown. Serve warm.

How to cook Rhubarb for Sauce.—Nearly all the recipes for cooking acid fruits advise adding the sugar after the sauce has become perfectly cold, claiming that the acid acting upon the sugar changes it to glucose and that the higher the temperature the more rapidly the change takes place, so that much more sugar is required, if it is added while the same is cooking.

Now we have no quarrel with our scientific friends, but we had always thought the flavor, color and texture of rhubarb sauce, sweetened just before removing from the fire, much finer than when the sugar was added just before serving; so we quieted our conscience about

the extra sugar used, by thinking how much better the sauce tasted.

To test the matter both methods were tried; 12 ounces of rhubarb were placed in a shallow stew pan with three ounces of water, closely covered and stewed rapidly until done, it was then turned out in a dish and set away to get cold.

The sauce pan was then washed and 12 oz. of rhubarb and three oz. of water was again cooked as at first, just before it was done, four oz. of sugar was added and the sauce allowed to boil one minute, when it was turned into a dish to cool.

Just before tea time, four oz. of sugar was added to the unsweetened sauce and well stirred in. Five people were at the table and to each one was given two dishes of sauce, that which had been sweetened while cooking, in a glass dish, and the cold sweetened, in a china one; after testing, each one was asked which sauce had the better flavor, also which was the sweeter, and the most attractive in appearance.

Every one at the table voted for the sauce in the glass dishes, as being best in flavor and appearance; two of the number could detect no difference as to sweetness, while the other three thought it the sweeter.

This test was perfectly impartial, as not one of the people who ate the sauce knew which dishes contained the sauce sweetened while cooking.

And now is our conscience clear, and lieth down like a lamb, as we put the sugar into the pie plant while cooking.

Forced Rhubarb Sauce.—Wash the stalks and cut in inch lengths without peeling. Put in a shallow stew pan with a very little cold water and cook over a brisk fire; when nearly done add one cup of sugar for every

two of rhubarb, let boil up and turn out to cool. Always use a porcelain or granite stew pan and turn into a glass or china sauce dish, as soon as cool enough to insure against breaking.

Cooked in this way the sauce will be a beautiful rose pink in color, and in flavor and texture, "Fit to set before the King."

Rhubarb grown in the field or garden may be cooked the same as the forced product, in the early spring; but later in the season, the following way will be found more satisfactory.

Rhubarb Sauce No. 2.—Wash and peel the stalks and cut in inch lengths. Pour boiling water over the rhubarb and let it stand until cold. Drain, and to each pint of rhubarb add one cupful of sugar. Let it stand until juice enough is extracted to cook it without adding any water. Simmer slowly until done.

To Preserve for Winter Use.

Rhubarb Jelly.—Pie plant or Rhubarb, alone will not make firm jelly; combined with apple or grape juice a firm, fine flavored jelly may be produced.

Stew the rhubarb until tender, strain through a jelly bag. Take nice tart red apples, wash and cut in fine pieces without peeling or removing the seeds or cores (unless wormy), stew as for sauce, but do not mash them up, turn into a jelly bag and let drain. Boil the rhubarb juice ten minutes then add the apple juice and boil twenty minutes. Warm, in the meantime, the sugar in the oven, stirring it often to keep from browning; allow one pound for each pint of the juice (measured before boiling); add the sugar to the boiling juice and continue to boil until it jellies on the skimmer; remove from the

fire and turn into glasses. Let stand 24 hours, and cover with a thin layer of refined paraffine wax. Tie down closely with paper, or use tin covers if you have them and keep in a cool dark place.

Rhubarb Marmalade.—Wash, peel, and cut up the rhubarb; weigh and put into a preserving kettle and stew until tender, add sugar in proportion of pound to pound; let cook slowly, stirring very frequently. Be careful not to let it scorch; an asbestos mat under the kettle will be a safeguard. When the sauce has a clear jellied appearance it is done. Take from the fire and put in glass jars.

Canned Rhubarb.—Prepare rhubarb exactly as for sauce. Use glass cans, fill them with boiling hot sauce until it runs over the top of cans, put on the covers and screw down as tightly as possible, wipe the can off clean and with the back of a heavy butcher knife press the flange of the cover down tightly against the rubber. Do not meddle with the tops after they become cold, trying to tighten them then, does more harm than good.

Canning Rhubarb in Cold Water.—Wash, peel, and cut up the rhubarb, have the cans clean and well scalded; put a cup of water in each can and fill in with the cut rhubarb pressing the pieces snugly together; set the can in a deep tin pail and pour cold water into can until it runs over, then fill up the pail so the top of the can is well under the water, when no more air bubbles rise from the can screw the cover on as tightly as possible. Remember the entire process of putting on the covers must be done under the surface of the water, this will effectually exclude the air, and if properly done the rhubarb will keep perfectly. When ready to use, pour off the water into the vinegar barrel and use the rhubarb

for sauce or pies, same as though gathered fresh from the garden.

Rhubarb Cooked in the Can.—Make a very rich syrup and fill the cans about one third full, then fill to the top with cut rhubarb, pressing the pieces into the can as tightly as possible; put the covers on loosely. Have a rack made with a slatted bottom which will fit in the bottom of the wash boiler, set boiler on the stove with a little water in the bottom, then set in as many jars of fruit as you can and put more water in boiler, until it comes within an inch or two of the top of cans; boil at least 10 minutes from the time the water reaches the boiling point. Lift the cans from the water and set on a thickly folded newspaper, take off the cover and fill the can to overflowing with hot syrup, put on the rubber and screw on the cover as quickly as possible.

To make the syrup, allow one cup of water and 10 oz. of sugar for every quart jar, put in a sauce pan and let come nearly to the boiling point.

Rhubarb can be put up without sugar, observing the general directions given above, using clear water in place of the syrup.

Rhubarb Shortcake.—This is sure to be appreciated by the whole family. Bake in flat tins a shortcake of rather rich biscuit dough, split open, butter well and spread with stewed pie plant. Serve with sugar and cream.

Rhubarb and Apple Pie.—Chop together an equal amount of apples and rhubarb. Fill a deep pie dish with this, putting in plenty of sugar, a lump of butter and sprinkling over the fruit a little flour. Cover with a top crust and bake.

Rhubarb Slump.—Peel and cut quite fine sufficient pie plant to measure one quart. Add to this a scant pint

of sugar and simmer gently until tender. Rub together one and one-half cups of flour, one tablespoon butter, one teaspoon sugar, one quarter teaspoon salt and one heaping teaspoon baking powder. Wet with milk to a soft dough, which turn on to a floured board and roll out in a thick sheet that will just fit the top of the saucepan containing the rhubarb. Lay this carefully over the stewing fruit, cover closely and simmer slowly for half an hour longer. Then lift the cooked crust to a deep dish and pour the pieplant over. Eat hot as it is, or serve cold with cream.

Rhubarb Betty.—Soak bread crumbs in salted water until soft; and arrange in a pudding dish alternate layers of the crumbs and rhubarb cut into small pieces. Sprinkle a generous amount of sugar and a little nutmeg on each layer. Dot the top with butter and bake in the oven until brown. Can be eaten with butter and sugar, or a hard sauce.

Rhubarb Fool.—Prepare a sauce with one quart cut up stalks and one pint sugar. When cooked rub through a sieve, return to the fire and stir for 10 minutes. Then set away until cold. With this, mix one pint of thick cream and serve immediately.

Rhubarb Jam.—Boil gently together for three hours an equal amount of granulated sugar and rhubarb, adding the juice and grated rind of one lemon for each pound of fruit.

Rhubarb and Orange Preserve.—Peel six large, nice, thin-skinned oranges; take off all the white rinds, and slice them into the preserving kettle. Remove all seeds from the oranges. Cut half of the yellow rind into small pieces, and put with the orange pulp into the kettle. Add two pounds of rhubarb stalks cut into small pieces, a teacupful of water and three and one-half cup-

fuls of sugar. Boil until the rhubarb is soft, and seal.

Steamed Rhubarb.—Wash, peel, and cut the rhubarb into inch pieces. Put it into a granite double boiler, add one cup of sugar for a pint of fruit, and cook till the rhubarb is soft. Do not stir it. When the rhubarb is very sour, steam it without sugar until the juice flows, then drain it, add the sugar, and steam again till the sugar is dissolved. Or pour boiling water over it and let it stand five minutes, then drain and steam.

Spiced Rhubarb.—Sprinkle two and one-half pounds rhubarb peeled and sliced thin with one pound sugar. Let stand over night and in the morning drain off the syrup into a preserve kettle, add one cup sugar, one-half cup water and one half cup vinegar. Tie in small cheese-cloth bags one half teaspoon each of cloves, mace, all-spice and ginger and one teaspoon cinnamon; boil until the consistency of syrup, then add the rhubarb and cook until clear. This is a valuable addition to the winter's stores.—[A. B. W.]

Rhubarb and Gooseberries.—A palatable preparation is made of half gooseberries and half rhubarb. Boil the rhubarb and gooseberries with a very little water; when soft, strain through a sieve, rubbing as much through as possible. Return to the fire and boil until it looks clear and begins to thicken. This will depend upon the state of the fruit. If the gooseberries are partly ripe it does not require so long boiling as it does when the fruit is riper and has more juice. Now add the sugar, equal weight with fruit weighed before boiling, and boil 15 minutes longer. Pour into bowls or glasses and when cold cover with paper. This is very clear and sparkling and has an excellent flavor. When cold it will turn out like jelly and may be cut in slices. It makes nice sandwiches for children.—[Eleanor M. Lucas.]

Rhubarb Compote.—Two pounds rhubarb all prepared, one and one-half cups sugar, lemon peel, one pint of water.

Rhubarb Tart.—To one quart of stewed rhubarb add three-fourth pounds of granulated sugar, five eggs, five ounces of pulverized crackers, after the rhubarb is stewed put through a sieve. The other ingredients should be mixed well. Use only a bottom crust and bake three-quarters of an hour.

Rhubarb Sherbet.—This is a pleasant, acid drink for warm weather. Wash the stalks and cut into inch pieces without skinning. Measure, and to one quart put an equal amount of water. Simmer until very tender. Add the grated rind of one lemon and three tablespoons sugar, stirring until the latter is dissolved. Cool and strain. Then chill on ice before serving.

Kansas Lemonade.—Put a little juice of stewed pie-plant into a glass of cold water, sweeten to taste and flavor with lemon.

Rhubarb Wine.—Peel, chop fine and mash the pie-plant to a pulp. Weigh and allow one quart water and one pound sugar to each pound of fruit. Mix well and turn into an earthen receptacle, where it should be covered with a cloth and stand until it ferments, being stirred daily. When fermentation ceases, skim and strain, pour into a cask and let stand open for 24 hours. Then close the bunghole and keep for four months, when it can be racked off into bottles which should be closely sealed and put away on their sides.

Rhubarb Vinegar.—Wash and cut the rhubarb into inch pieces without peeling. Pound with a wooden potato beetle; measure and put in a large stone jar. To each quart allow one pint water. Cover with cheese-cloth and let stand in a warm room for 10 days, stirring

twice a day. Strain through cheesecloth, measure and return to the jar. Allow one cup sugar to each quart of liquid. Add a few spoonfuls water, dissolve over the fire, cool and add to the contents of the jar. Cover again with the cloth and let stand as before until it is a good strong vinegar, then bottle.

END OF PART ONE.

PART II.

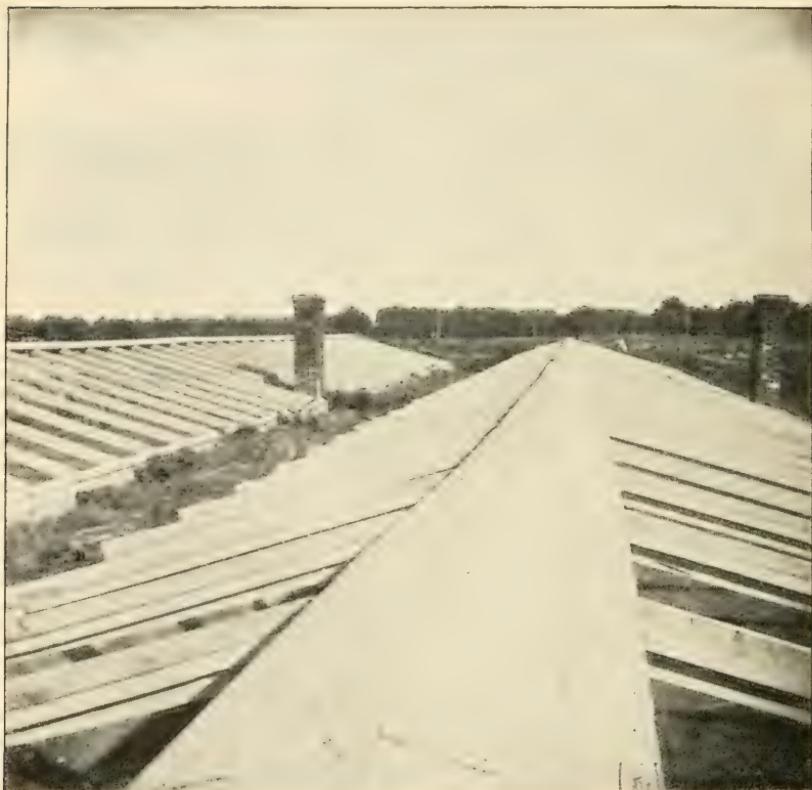
CHAPTER I.

VARIOUS FORCING METHODS.

SOME growers near Boston and New York have rhubarb beds especially for forcing under glass without transplanting. They are set closer than for field culture say two feet or 2 x 3 feet apart, the rows being short and numerous thus giving the bed of rhubarb the shape of an ordinary rectangular greenhouse, averaging say 20 x 75 feet. At the side of this bed a skeleton frame is erected, as for the ordinary sash house. Then when desired to force the crop, say any time from December to February, the space is covered with hotbed sashes, the sides being boarded up and banked around with manure.

Sometimes steam pipes are run into the rhubarb house, and the house then becomes like a greenhouse in conditions, forcing the crop rapidly. The heat of the sun alone and that of the manure piled around the outside hastens the crop greatly. The snow quickly melts away. Sometimes the sides of the house are covered with building paper. As soon as the weather becomes warm the sash and frame are removed and the plants given ordinary field culture. By this plan the crop is forced without disturbing or injuring the plants which are already in place for the following season, and summer culture is made very easy and simple. When sashes are not wanted for the rhubarb house, they can be used on hotbeds. Much of the very early native crop around large eastern cities comes from cold frames and forcing houses built according to the plan just described.

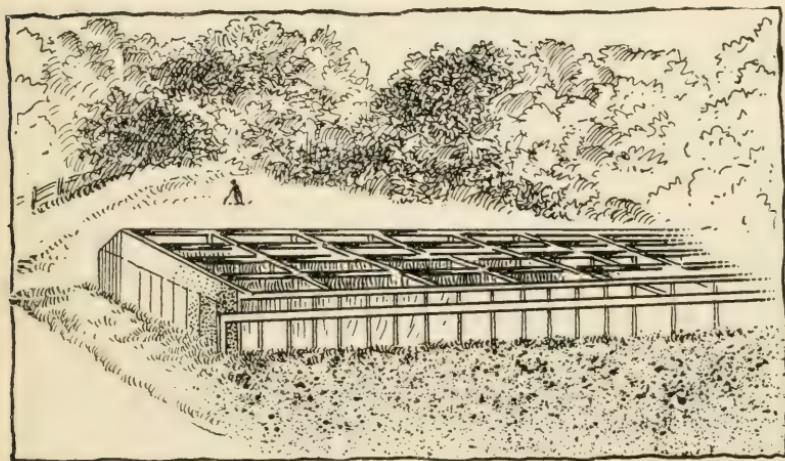
The more modern of these houses have an even-span roof, two or more rows of sash on a side. The board sides are three to four feet high, and the ridge six to eight feet high, giving sufficient pitch to the sash roof. Sashes are held in place by screw bolts, and about one-



LONG ISLAND SASH HOUSE.

third of the sashes on the upper rows on each side of the house are hinged at the upper end to allow them to be raised for ventilation. The ridge where the sashes come together at the top may be protected with roofing paper, and weather strips at the sides of the sashes will save heat.

A somewhat different style is common on the farm gardens of New Jersey and Long Island. One of these at Flushing, L. I., is shown in the illustration. The sides of board are only two feet high, but working space is secured inside by means of a sunken walk through the middle, thus dividing the interior into two beds extending lengthwise. These beds are a foot lower than the ground outside. There are two rows of sash on a side. The frame is nicely beveled to receive the sash, and the



HOT WATER FORCING HOUSE.

ridge is protected by a permanent board covering. Roots are taken up and packed closely, as in cold frames. No artificial heat is usually considered necessary.

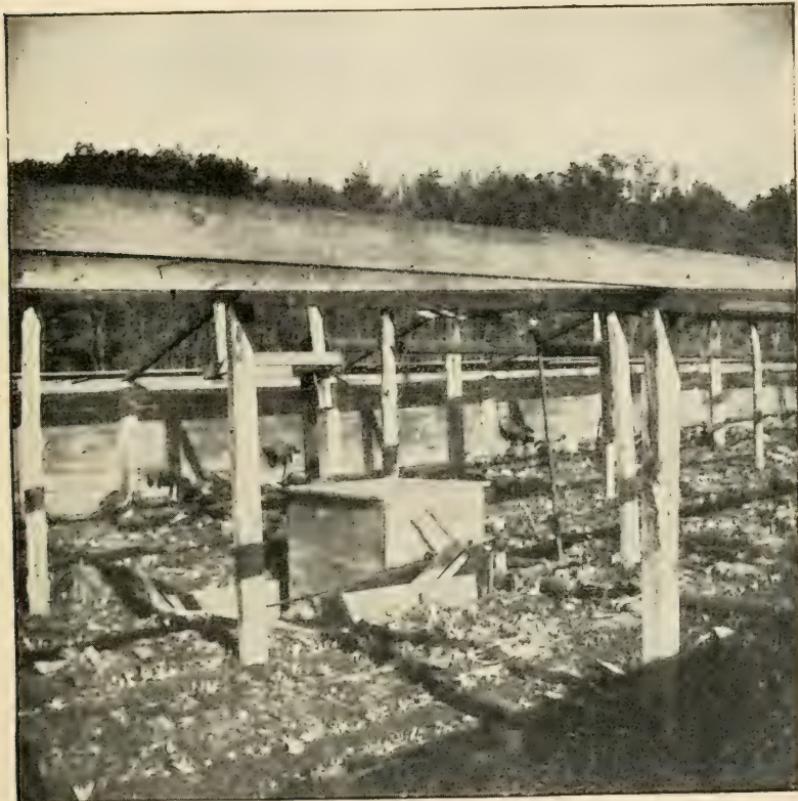
Hot Water System.—On the market garden farm of Edward Farmer in the Boston district is a large sash house, resembling an enlarged cold frame, but supplied with extra heat by means of hot water pipes. The house is about 260 feet long and divided crosswise into halves by a board partition. Each half is forced once in two years, thus allowing a full season's growth to

gain strength after the process. By this plan the plants have retained their vigor for six or seven years, if the hills are kept down by dividing; but must be renewed or replaced at the end of that period. Plants are set 2 x 3 feet, being forced where they grow.

A section of the interior is shown in the illustration herewith. The building is about 30 feet wide. The roof pitches enough to run most of the water off the sashes, but if some leaks inside the crop is not harmed. Each side of the roof is four sashes wide. The sides of the building are of inch board the upper two-thirds protected with felting paper. The banking of manure covers the lower third of the sides and is applied at the time the sashes are put on. The heater is one of the kind often used for heating dwellings. It cost \$50 without the piping. The heating pipe runs the length of the building about three feet high, and the return pipes are close to the sides of the building near the ground. The box-like structure in the picture is a wooden covering for the heater.

No attempt is made to secure ordinary greenhouse conditions. Sometimes in very cold weather the temperature goes away down, and the heater scarcely keeps its pipes from freezing. But even if the leaves of the hardy plant are stiffened with the frost, no permanent harm is done. There are no pests or diseases in the forcing house and the crop is regarded as a sure one. It brings from eight to 15 cents per pound in the Boston market. A very interesting feature of the house just described is the way in which an extra crop is secured, at slight cost. In September, two rows of dandelions are transplanted between the rows of rhubarb as in the illustration, the plants being obtained from a field outside. These are of a cultivated variety. When heat is

applied, the dandelions start in about four weeks and are out of the way before the rhubarb needs the room. The rhubarb is allowed to grow until it is well matured and is picked only once, but the single picking is a thorough one. The crop occupies the house from De-



HOT WATER FORCING HOUSE (Interior View).

ember to March, after which period the glass is taken off and used for other crops. Several other growers use practically the methods just described, some having steam heat in place of hot water, and running a pipe into the rhubarb house from an adjoining greenhouse.

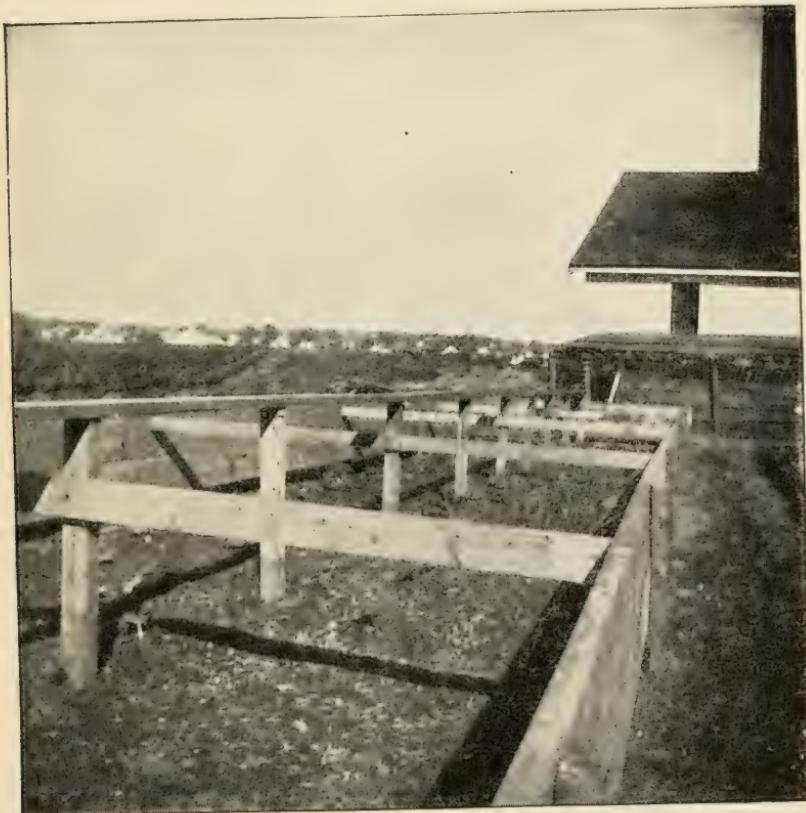
Cold Frames.—The common plan for forcing with-

out artificial heat is by the use of cold frames made rather deeper than ordinary, to allow full growth of the stalks. Some cold frames are sunken pits, two feet deep and covered with sashes. But the usual way is to inclose with boards a patch of rhubarb thickly planted, and cover it with sash at the proper season, usually in December. The only heat supplied is that of the sun retained by the glass, and that afforded by a mixture of manure and earth, banked up against the sides. Some growers cover the plants with 18 inches of litter or coarse manure during cold weather, also putting on the sash and straw mats or wooden shutters, the object being to keep the soil in the frames from freezing deeply. The covering is raked off as soon as the coldest weather is past. Most growers use no protection other than the glass.

The care of cold frames for this hardy plant is so simple and easy that a beginner will have no trouble. A little ventilation must be given on warm days, by raising the sash slightly. Watering with a solution of nitrate of soda, a teaspoonful to a pail of water will help force the growth. Not much water is needed and many do not water at all. A board shutter, like the one illustrated, put over each sash on cold nights will prove a help, but the shutter is not an essential for rhubarb, as a freeze does not permanently injure the plants. Stir the soil with a hoe and pull the weeds.

The illustration shows a good specimen of a double-sash rhubarb frame without heat other than that supplied by banking up with manure on the outside. For this purpose the rhubarb is set 2 x 3 feet, and the frame is put on without moving the plants. Two rows of sash cover the frame and are put on the last of December, and the sides are banked at the same time. This

particular frame belongs to the great Rawson greenhouse plant near Boston, Mass. The sides are of two inch plank, two feet high, and the sash supports are of 2 x 4 inch joists. The rhubarb is picked moderately two or three times a season, and does not seem to be

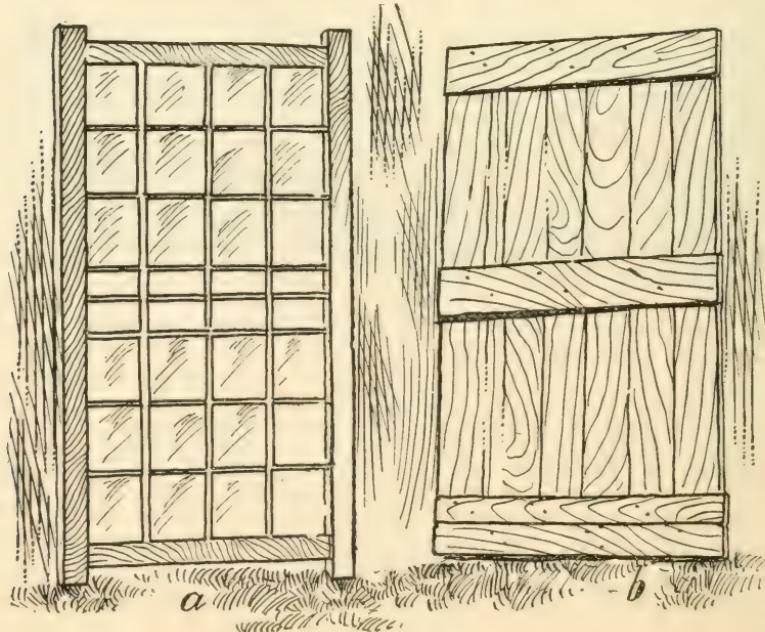


W. W. RAWSON'S COLD FRAMES FOR RHUBARB.

weakened much by the process. The variety is the Linnaeus. The location is at the south side of other buildings, thus securing protection from the cold winds. Such a location is a very important aid to earliness. Where there is no room for the forcing patch south of other buildings, it will pay to erect a board fence for



LONG ISLAND COLD FRAME.



SASH AND SHUTTER.

a shelter. For cold frames, Linnaeus is usually considered the most satisfactory variety. The plan just described, where a plot is inclosed and forced where it grows in the field, represents the common practice in the Northeast. In the gardening districts around New York and Philadelphia, the roots are often dug up and packed side by side in the frames, filling the spaces with earth. The practice saves space but makes more labor and causes greater injury to the roots.

One of the Long Island cold frames for single rows of sashes is also illustrated, being shown without the glass, as in summer and fall. The sides, two feet high, are of inch board supported on edge by small stakes driven close to the board. The alley between the string of frames is two feet wide. During summer the sashes are removed and piled, the ends of the string of frames are removed and the ground kept in cultivation by horse power. Very little hand work is needed with this crop. No crossbars are used. By having one side about six inches lower than the other, the fall will be sufficient to carry off the water, but for a hardy plant like rhubarb, leakage is not considered of much consequence. The roots are transplanted and are packed in the frames the last of December.

The method of making hotbeds for rhubarb is very similar, but rather more care is taken to preserve heat, and by the method described in Part First, Chapter II., no glass is required. The cold frames, having no manure to supply heat and depending wholly on the heat of the sun, cannot be used to force a winter crop, but will bring the spring crop a week or two earlier than the outdoor grown, and will produce equal weight in yield as compared with hotbeds. The method of forcing rhubarb

under greenhouse benches is described in Part First, Chapter II.

One grower near Boston estimates the yield of rhubarb under glass at 20 pounds per sash, worth at five cents per pound, \$1. The distance here was 2 x 2 feet. The crop grew in about five weeks, after which the glass was removed and used over radish hotbeds. Steam was used to force this crop, the roots remaining in the ground throughout the year.

Steam Forcing in Open Fields.—Winter forcing in the open field has been found practicable, the soil being heated with steam or hot water introduced through underground tunnels. European gardeners sometimes construct permanent tunnels of brick between the rows, and heat the plant beds with hot water through pipes laid in these tunnels. A less expensive plan of field forcing has been successfully tried at the Missouri experiment station; asparagus being grown from 1896 to 1899, while during the season of 1900-1901, the rhubarb crop was treated in precisely the same manner and with every indication that the results would be equally favorable.

The idea of this method is to avoid the expense of piping or other construction, by blowing hot steam into board tunnels between the rows. Trenches were first made between the rows, which are four feet apart. They were opened with a plow, going once through and back again, and were made uniform by means of a spade. These trenches were then covered with 12-inch boards, which rested on four inch blocks, placed at frequent intervals along either side of the trenches. This formed tunnels between the rows for conducting the steam. To guard against the steam's escaping, two or three inches of soil was placed over the boards, and the plot was then

covered with five or six inches of horse manure. This covering was to prevent the heat from escaping from the soil too rapidly. It was then ready for the steam to be turned into the tunnels. In the illustration one of the tunnels has been uncovered to show its construction.

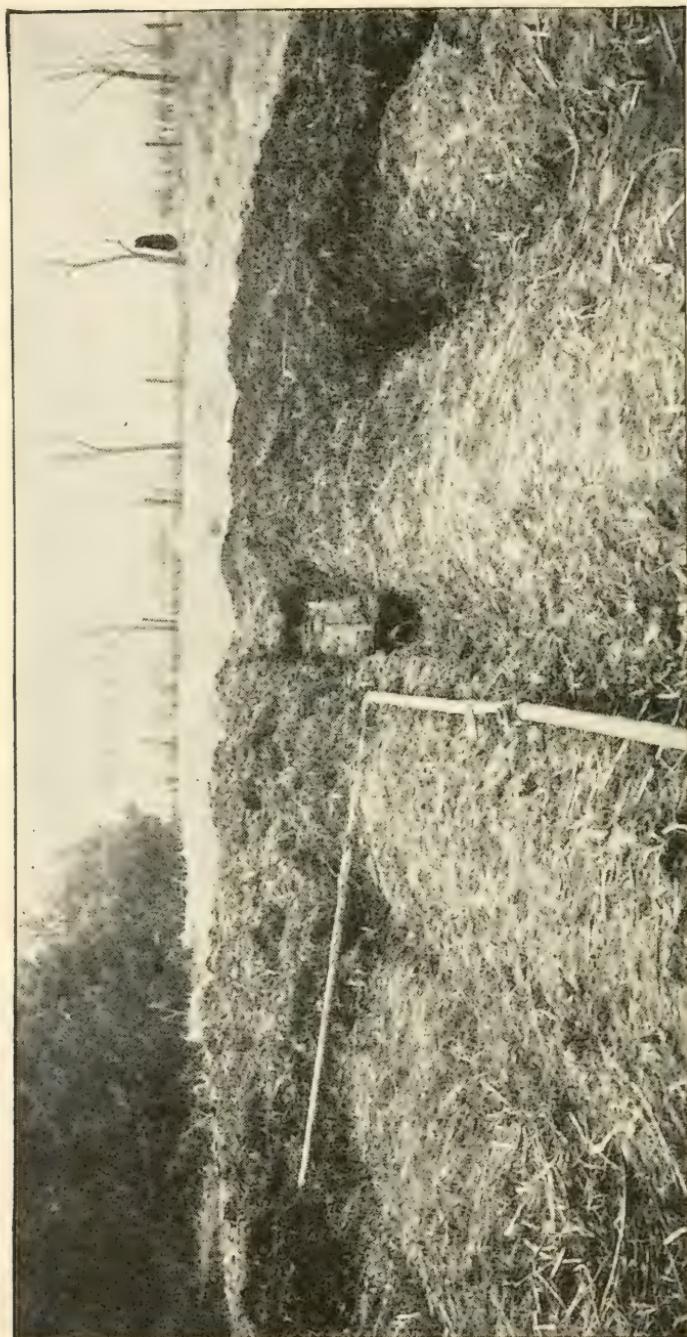
To conduct the steam a one and one half inch pipe was carried above ground from the boiler to one end of the central tunnel, a distance of 185 feet. A steam hose long enough to reach each tunnel was attached to this pipe through which to blow steam into the tunnels. It was not the idea to give a constant supply of steam, but to discharge a little into the tunnels each afternoon, or as often as was necessary to maintain sufficient warmth. A piece of tile was inserted into the mouth of each tunnel to prevent the discharging steam from tearing away the earth.

The first steam was turned into the tunnels on November 14. Steam was discharged into each tunnel, not to exceed five minutes at a time, in order not to heat the earth too hot in any single place. It required about one hour of steaming the first day to bring the bed up to the required temperature of 60 degrees. The distribution of heat throughout the bed was very uniform and satisfactory. The moist steam seemed to permeate the soil equally in all directions.

After the first day, very little steaming was necessary until the crop began to be produced.* On an average the bed was steamed about twice in three days and then only for about five minutes for each tunnel. The soil and horse manure mulch seemed to hold the heat very well, the frequent steamings keeping up fermentation in the mulch.

The first picking was made in ten days. When steam was not turned on until the last of December, the crop was not ready until the middle of January. The results are thus summarized by Horticulturist Whitten:—

The steam, coming in direct contact with the soil,



STEAM FORCING IN THE OPEN FIELD.

readily penetrates it, heating the whole bed uniformly; whereas if the tunnels are heated by inclosed steam or hot water pipes, the soil becomes too hot and dry close to the tunnels while it is too cold midway between them. Forcing steam into the tunnels keeps the soil moist and maintains more continuous fermentation of the manure mulch, thus promoting steady heat.

The crop produced in this way was larger, of finer quality, and the bed produced longer, than that forced by any other method tried. The plants thus forced recuperate by being allowed to grow one summer without cutting, while plants transplanted for forcing are ruined by the process.

The amount of soft coal used to force a plot 25 x 25 feet, in this way, from December 29 to February 25 (58 days), was 2,308 pounds, costing \$1.82, or an average of 39 pounds daily. During these 58 days, steam was turned into the six tunnels of this plot a total of $16\frac{1}{4}$ hours, equivalent to 17 minutes daily, or less than three minutes daily for each tunnel. The forced asparagus yielded, during the 58 days, at the rate of 9,882 bunches, or 4,880 pounds per acre. The yield of rhubarb has not been stated. About five minutes at a time is as long as steam can be forced into a tunnel without danger of overheating the plants.

Forcing the crops where they can be grown in the field, has a twofold advantage; saving the trouble and cost of transplanting, and avoiding the injury done to the plants by transplanting.

Exhausting steam into the bed, instead of returning it to the boiler in an inclosed circuit, would, at first, seem to be a wasteful process of heating. Experiment showed, however, that the circumstances justified this method. Heating a bed of this kind by a circuit of steam pipes or hot water pipes is very unsatisfactory. The heat from pipes very soon dries out the soil around the tunnels, destroying its power to conduct heat. In this way the bed becomes too hot and dry adjacent to the tunnels, and too cold a short distance from them. It also becomes necessary to maintain heat in the pipes a good part of the time.

By blowing steam directly into the tunnels the soil is kept moist; the steam has a penetrating effect, and permeates all parts of the bed, giving a uniform heat throughout; this moist steam keeps up a continual fermentation of the manure mulch, thus giving heat and only occasional brief steamings are necessary. Care must be taken not to use too much steam at one time, or the plants may be ruined by over heating. Our rows were four feet apart, the tunnels midway between them were only eight inches wide, and yet we found that five minutes at a time was as long as was safe to force steam into a single tunnel.

These experiments have been so successful as to indicate that anyone provided with a steam heating plant could successfully force asparagus or rhubarb for the markets in this manner. To still further test forcing by steam, in the open field, we are now growing a field in which four inch drain tiles have been placed one foot below the surface, in such a way that we expect to use them for under-drainage, for sub-irrigation and for steaming the crop for winter forcing.

Exhibition Stalks.—When it is desired to grow especially large stalks of rhubarb for a choice trade or for exhibition purposes, it is possible to increase the natural size by thinning out all but the vigorous center buds, simply cutting them off with a sharp spade, allowing the whole strength of the roots to go to the large, vigorous looking buds, of which not more than one or two should be allowed to develop. To stimulate the hill to its utmost, set a large flower pot into the ground between the hills, in the row, as in the accompanying illustration, and fill it often with liquid manure of which too much cannot be given. A good substitute for liquid manure is nitrate of soda dissolved in water, using about a tea-spoonful of the soda to two or three quarts of water. Varieties like the Mammoth treated by this plan will grow stalks of enormous size and attract much attention.

at the local agricultural fairs and prove a splendid advertisement for the grower.

A Good Plan for forcing in the early spring although somewhat more expensive than the one of heaping up earth, is by use of frames made by driving stakes into the ground each side of the row between every pair of hills. These project three feet above ground, and leave two feet between the opposite rows of stakes. Slant the stakes one way a little so that they are only 15 inches apart at top. Fasten the laths to the top of the stakes,



FORCING WITH LIQUID MANURE.

and also along the sides. Then cover the frame all over with fresh, strawy stable manure, making a layer about one and one-half feet thick. Inside the frame the temperature will be quite high, sometimes 60 degrees or more. If it rises too high, holes may be made through the top of the frame for ventilation. This plan will force the rhubarb almost as well as a hotbed and does not require transplanting the plants. It does not permanently weaken the plants as it does to put them in greenhouse forc-

ing beds. The growth of the plant may be considerably hastened by a simple covering six inches deep of light, strawy manure, taking care not to cover them so deeply as to cause the plants to decay. It sometimes happens that a gain of a few days in supplying the local market will increase the total receipts from the rhubarb plantation by one-third. The price will sometimes drop within a week from 10 cents per pound at retail to three or four cents, and all the profit is made by the man who gets the top prices. In city markets the difference between the very early prices and those a little later is not so pronounced on account of competition of greenhouse and southern rhubarb. But in many of the smaller cities, the supply is entirely from outdoor growth, and the earliest stalks are bought eagerly and at a high price.

A Plan of Forcing sometimes practiced is to transplant the hills into large deep pots, the space around the roots being filled up with sandy loam and the pot set in the cellar where the temperature can be raised sufficiently to start vegetation. As soon as the heat is applied the plants will begin to start, each pot will produce two or three cuttings. After the third cutting the roots may be taken up and replanted where they will begin growing again without having suffered very serious injury in the process. If there is a sufficient supply of roots dug the pots can be refilled and another early crop grown.

A Practical Way to blanch stalks in spring is to throw up the soil with a plow about a foot thick over the hill. Nearly the whole stalk will then be blanched and more delicate in color and flavor. This covering of earth must be leveled down when the cutting ceases. Keeping up the leveling process will dispose of most of the weeds. The leaves after cutting, if spread on the

earth about the hills, will also assist greatly in smothering the weeds, besides having considerable fertilizing value and acting as a partial mulch.

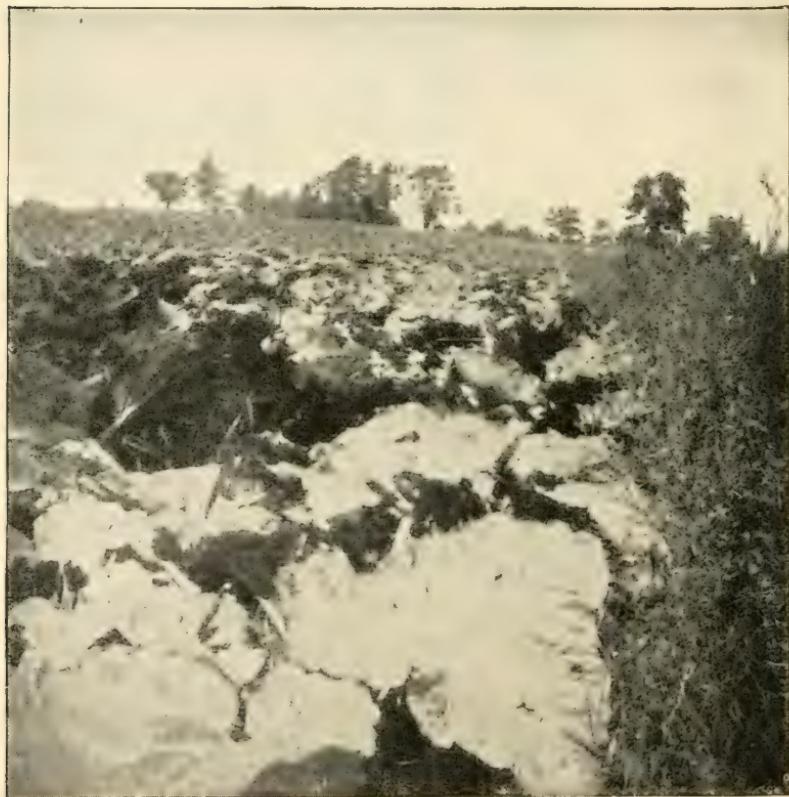
It is customary with many gardeners to place headless barrels or boxes over the hills in spring in order to force an extra growth of stalk. By this plan the stalks shoot up long and slender but do not weigh more than if left to grow in their natural manner. They are rather more tender than stalks not forced, but the process somewhat weakens the hill, and it is on the whole not profitable.

Portable Forcing House.—In his forcing book, Professor Bailey describes a unique plan for open field forcing by installing a system of surface steam pipes to be covered with a movable roof of muslin. In spring the cloth roof is removed.

CHAPTER II.

EXPERIENCE IN FIELD CULTURE.

As a farm or market garden crop, rhubarb is grown in large tracts near many of the principal cities of the United States. Methods everywhere are quite similar.



RHUBARB FIELD IN JAMAICA, L. I.

Immense quantities are brought to the markets of Greater New York by New Jersey and Long Island farm gardeners. One of the most extensive growers is

Abram Van Sicklen of Jamaica, L. I., who devotes about 12 acres to the crop besides 300 sash for cold forcing. One of his main fields appears in the illustration.

The plan of management is as simple and inexpensive as possible. Plants obtained by division of old hills are set $4\frac{1}{2} \times 2\frac{1}{2}$ feet. The soil is light clay loam and is well manured before plowing. Cultivation begins early in spring, is repeated as often as the ground gets hard or weeds appear, and continued until plants begin to die down in autumn. Manure is plowed in each fall and sometimes a dose of ready mixed commercial fertilizer is applied in the spring. Stalks are pulled only once each season, but the harvesting is quite thorough, all the large stalks being removed. The crop is marketed just as pulled, leaves on, and stalks tied in bunches of two or three pounds. These bunches are packed on market wagons as closely as possible and carted 10 or 12 miles to market. Mr. Van Sicklen estimates the yield at 10 tons per acre in favorable seasons. He does not consider the outdoor crop very profitable on account of low prices in recent years. When the market is oversupplied, the surplus must be sold to canners at almost give-away prices. The variety grown on the Van Sicklen farm is the Victoria, which although later than the Linnaeus is of better size and appearance, and as soon as it enters the market the smaller kind is crowded out. Canners will not usually buy the Linnaeus. Growers who have extra early land find it nevertheless profitable, because it reaches the market several days before the Victoria.

Four acres of Mr. Van Sicklen's 12-acre tract are devoted to growing plants for the cold frames. After once forcing, these plants are usually thrown away as worthless. Hence new plants must be started every

year in order to have enough mature plants ready for forcing and to renew the outdoor plantations which are plowed up every three or four years, or as soon as the stalks get too small for bunching, and a new plantation is set on fresh land. The cold frames are of a common style except that the sides are fully two and one-half feet high to allow for growth of the rhubarb stalk. They are illustrated on page 80. Two-year-old plants are packed into frames as closely as possible and the spaces filled with earth and manure. Sashes are put on early in February and the crop gets to market well ahead of the field-grown product. It is marketed in the same way as the open-air crop, but with more care in cleaning and bunching.

For the Washington Market.—The most southern district in which rhubarb is grown in large acreage, is the market gardening section of Maryland, supplying the city of Washington. Many of the gardeners raise from one to three acres, and the aggregate is large. The plant seems to thrive, and there is always a surplus of the product for early shipment to the various northern cities. By using hothouses, hotbeds and cold frames, assisted by the warm climate, some of the growers obtain a very early and profitable crop.

A leading grower of this section, Mr. Elias B. Rowell, writes: "A well drained but moist loam seems to suit rhubarb the best. The plant will be killed by standing water, but having a rank habit of growth it requires an abundance of moisture.

"The early rhubarb sells the highest. Hence a southern exposure and protection from north and west winds are desirable. The people in this neighborhood are market gardeners and small truckers growing quite a variety of crops. Hence there are no very large fields of rhubarb

here, three acres would be about the limit for any one grower. There is but one variety grown in this section, the Linnaeus.

"Rhubarb is usually planted about 3 x 3 feet, the sets being made by subdividing the old hills. About the time the rhubarb begins to start in the spring the hills are covered with fresh manure to induce earliness. I sell my rhubarb in Washington, but a large part of the crop is shipped by dealers to places further north. Very little rhubarb is sent here from the south, our early market being supplied by rhubarb grown in hothouses, hotbeds, cold frames, etc.

"The crop is a profitable one on soil that is adapted to it. For outdoor rhubarb the price ranges from five cents to two cents per bunch of four or five stalks, the size and length increasing as the price decreases."

A Veteran Rhubarb Grower in the Boston market gardening district, Mr. M. Sullivan of Revere, kindly supplies the following account which fairly represents the methods employed in that section:—

"I would select a location open and free of trees, south or southeast aspect, having a deep, rich soil. Open deep furrows with the plow four feet apart, shoveling out all loose soil down to hardpan. Fill one-half of the open furrow with the best well rotted stable manure in which set the roots two eyes to a piece. Cover with the hoe or a very light furrow with a one-horse plow, the plants to be three feet apart in the row. The varieties most cultivated are the Linnaeus and Victoria. The first named is about two weeks earlier than the other, and it is yet an open question as to which is more profitable.

"The time of planting considered best by market gardeners is just after the spring crop is gathered; this would be in July and August. The first season, keep

the ground stirred and free from weeds, and in the fall apply a liberal quantity of stable manure placed directly on top of each plant. The second year in the spring the ground is plowed between the rows and the manure on top of the rows forked under.

"No cropping should be allowed the second year after planting, but the ground kept well cultivated and free from weeds.

"In the fall a heavy dressing of manure should be spread all over the planting and this plowed up towards the rows. The third year from planting an early forking up of the soil about the plants will help forward them, and one or two stripplings for market may be made. The plantation is then made and is good for from six to ten years according to care and cultivation. It would be fair to estimate the average annual value of the crop at \$200 per acre.

"The preparation for market is simply to remove the leaf down to about two inches of the stalk, and pack in boxes or tie in bundles of 20 to 30 pounds. Weighing should be done at time of loading and tags attached or the weight numbered on boxes, preparing in this way for instant delivery."

Chat on Rhubarb.—On the Squire estate near Boston is a one-acre patch of rhubarb which produced large and paying crops for many years. "How large a crop do you get?" was the question asked of Foreman Connell.

"From eight to 10 tons, so far this year, from this field of one acre," was the reply, "and we shall keep on picking for a month longer. We picked three rows this morning and sent in 4,600 pounds. We go over about one-third of the patch every other day, so that the whole field is gone over about once a week."

“What are the prices?”

“A cent and a-half to-day (May 15). The first picking was sold at four cents, which was a lower figure than usual at the start. The western rhubarb keeps the price down this year. Usually it does n’t go below one cent, but I should not be surprised if it should drop to 50 cents a hundred this season.”

“What is the variety?”

“The Victoria. That is the largest and best.”

“How do you gather it?”

“We have one man go between the rows, pulling two rows at a time. Others follow and cut off the leaves, clean the stems and pack in barrel boxes. At the work-room the rhubarb is tied in bundles of 25 or 30 pounds each.”

“How is the rhubarb cultivated?”

“There is n’t much work to it. The big leaves shade the ground and smother the weeds. The hills are set 4 x 4 feet, but we only cultivate one way. We begin after picking time and cultivate a few times before autumn, when we apply about 12 cords of horse manure per acre broadcast and cultivated into the soil. Then in the spring we cultivate again. That is all.”

Methods in Illinois.—The earliest field grown rhubarb reaching northern markets, excepting a few shipments from the Pacific coast, comes via Chicago from the extensive growers of southern Illinois. These shipments have for the past dozen years skimmed the cream of high prices, and the growing competition is severely felt by eastern producers. The Illinois district is near the southern limit of the greatest vigor of the rhubarb plant, and is favored with sunny skies and early soil. The methods are not essentially different from those of other sections, as may be seen from the following account

of the management of James Bell's large field in Union Co., Illinois:—

"I have about 20 acres of pie plant under cultivation. I do not know what varieties they are as the first I planted I got the roots from a farmer here and have never made any test as to variety. At the present time



RHUBARB READY FOR NEW YORK MARKET.

I am raising live stock and get the manure from them to fertilize with and believe that is the best plan. The manure is spread over the ground, but not on the hills, in the fall and turned under.

"The plants are set four feet apart each way, and about four inches deep. I try to keep them free from all

grass and weeds by running a double shovel twice each way through the rows five or six times during the season after pulling for market. No irrigation is needed here. I do not try to force but where possible plant on a slope toward the south. To gather the crop the pullers



RHUBARB IN FIELD CULTURE.

go first pulling two rows, laying the stalks in the middle between the rows. The trimmers come after them cutting off the leaves and placing the stalks in boxes. These boxes are carried to a bench and are there packed for shipment in a 50-pound package which I manufacture,

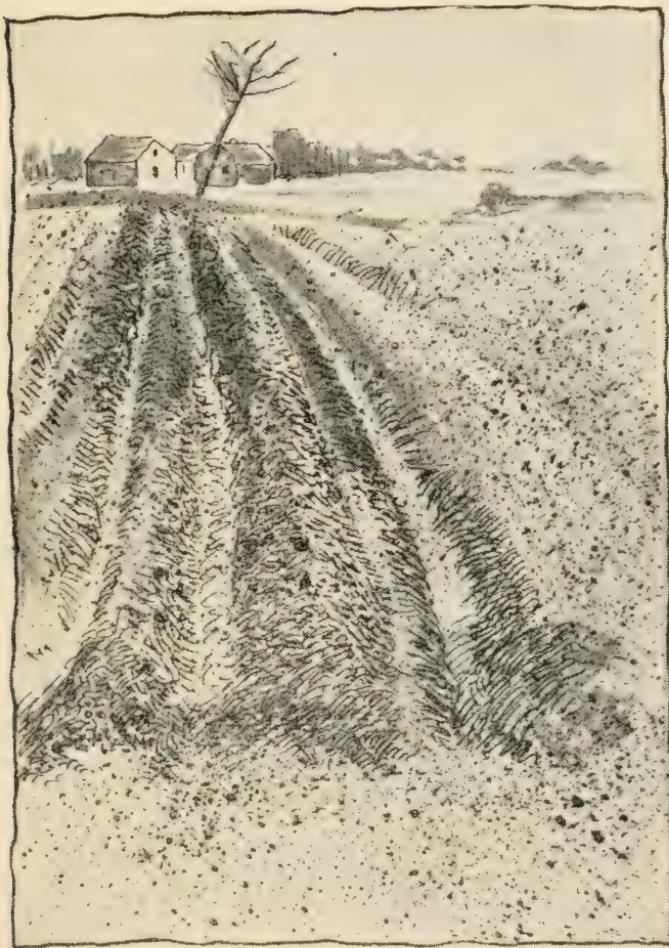
22 inches long, having two heads, each 12 inches square. The price in Chicago market begins at six cents and gets as low as one cent per pound."

A Wisconsin Specialist.—In the region about the great lakes are many rhubarb specialists, who devote large areas to the crop, and ship much of the product south and east to the large cities. The business of winter forcing elsewhere described in this volume, has reached great development in the section to which allusion has been made. One of the most extensive growers of the open-air crop is Mr. F. S. Thompson, of Wisconsin, whose annual yield of 100 tons or more requires 10 to 15 acres devoted to the plant in various stages of growth. His methods may be summarized as follows:—

A black, sandy loam is preferred. If sod land is used it is worked one season before setting to rhubarb. In the spring the surface is heavily manured, then the land is plowed deep and well harrowed, leveled with a drag, rolled, and the rows marked. Ashes, bone meal, or hen manure are sometimes added as an extra dressing when available. Plants, usually obtained by division of old roots, are set 4 x 4 or 4 x 5 feet, according to the variety of rhubarb. Every ninth row is left unplanted to allow a driveway for teams in tending and harvesting the crop. Holes for planting are made with a spade. Several shovelfuls of manure are put in with each plant. The plants are set crowns level with the ground. Stalks are not pulled from new beds until the third season.

During the season the cultivator is run often enough to keep down the weeds. Late in the fall, any remaining weeds are pulled up and carried away, also the leaves and refuse, to prevent frost being held by them in the

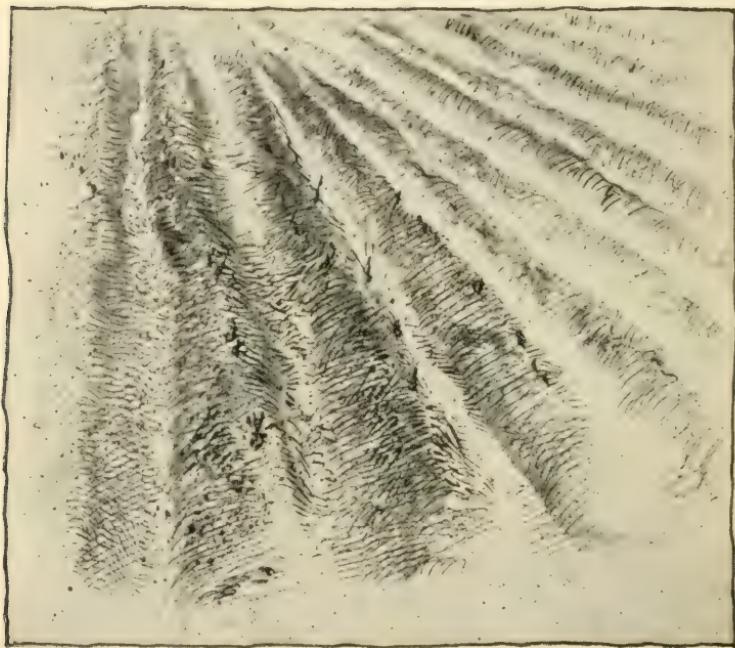
spring. But if leaves are not very numerous they are allowed to remain. Finally, a furrow is plowed close beside each row on one side only as in the illustration,



METHOD OF RIDGING IN FALL AND SPRING.

and in such a way that the ridge is left facing the south. That is to say, the furrow is made on the sunny side of the row, the idea being that the exposure brings out the frost more quickly in the spring.

These furrows are half filled with coarse manure the following spring and the ridge of earth near the plants turned back, covering the manure and leaving another small furrow very close to the hills. This second furrow is partly filled with manure, and finally the whole surface is leveled off with a fork or pronged hoe, at the same time taking pains to stir all the soil about the



RIDGED BED IN WINTER.

hills. The application takes 25 to 50 loads of manure per year per acre.

The first stalks are pulled when not over six inches high. The help are instructed to grasp the stalk near the lower end, and to avoid breakage the pullings are left in the sun until slightly wilted, thus making such kinds as the Victoria less brittle. The stalks are carted to the packing house, where the root ends are cleaned

and the leaves clipped within less than an inch of the stalk, if meant for distant market, but for local trade the leaves are left on. Bunches are made up of from two to five stalks, according to size of stalks, tied with twine, and carted to market or crated and shipped.

This grower trims old, overgrown roots with a plow, simply gouging off a portion of the hills when they become overgrown. The part torn off by the plow in this way is of little use for transplanting, and does not leave the hill in such good condition as when the work is done with a spade. But for large fields the plow method is a great time saver. From the parts torn off by the plow, many plants can be picked out which will answer for transplanting, although most of them are too ragged in appearance for anything but home use. Unless the hills are trimmed in some way the stalks grow smaller year by year, until in five or six seasons they are not large enough for market.

On this farm the favorite variety is the Red Mammoth, because of its large size, red color and great yield. Mr. Thompson estimates the product of an acre of this variety at over 3,000 dozen bunches per year, worth in the Milwaukee market on the average between \$500 and \$600. He estimates for one acre the average yearly expense, taking a term of twenty years, at about \$150 per year. When growing rhubarb in hotbeds, he counts on \$10 to \$15 per sash of common size.

On the Pacific Coast the rhubarb crop succeeds under irrigation or in the cool, moist climate of the regions near the sea. In California there are large growers who supply the local markets and who also ship large quantities overland to the cities of the eastern and central states. In the state of Washington the cultivation of rhubarb has hardly passed the experimental stage, but

some at least of the standard varieties have been shown to succeed. Both in Washington and Oregon the Chinese gardeners have supplied a good share of the market product; in fact the largest growers in Oregon are Chinamen. The yellow gardeners manure highly and cultivate thoroughly, which are the two main essentials in field culture, and the plant thrives luxuriantly under their care. The horticulturist and gardener of the Oregon experiment farm, George Coote of Corvallis, describes his method of cultivation as follows:—

“Before planting out, I have the soil deeply plowed up two furrows deep; this is done by plowing the first furrow deep, and following in the same furrow, thus getting a depth of 15 or 16 inches. Then I place well rotted manure in the bottom of the furrow, and with the hoe I pull in about six inches of soil over the manure. This done, I plant every five feet in the row. I find that the plants make a much better growth when treated in the manner described, as it enables the roots to penetrate the soil, and the growth is much better than in shallow soil. The varieties grown here are the Victoria for early and the Giant for late.

“I have relied on barnyard manure only, digging it in around the plants in the late fall. In early spring I have used the liquid from the stable, diluting one-half with water, and placing it in a small trench around the plant and letting it soak down the roots. This treatment I find helps the growth wonderfully. My method is not to pull the plants every year, as they soon run out. I find by giving them a rest every other year the strength is kept up. I pull every other plant this year and give it a rest the next. Constantly pulling weakens the plant to such an extent that in three or four years it is fit for nothing.”

CHAPTER III.

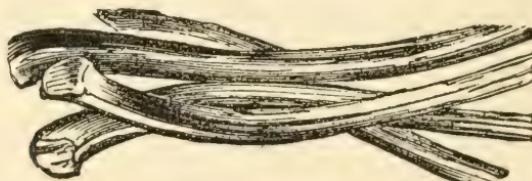
VARIETIES AND STATION TESTS.

SEVERAL of the standard kinds are briefly noticed at the conclusion of Part I, Chapter III. The ordinary varieties succeed in all parts of the country except in the extreme south, where drought and continued hot weather prove unfavorable; the plants shoot up to seed, and, unless favorably situated, soon die out. In the eastern states the kinds mostly grown are Linnaeus for early and Victoria for late. Other kinds are reported tried only in an experimental way. In the South these two standard sorts appear to have been the only ones publicly tested.

The same varieties constitute the great bulk of rhubarb shipments made by the extensive growers of the central western states to eastern markets, although the larger kinds have lately been meeting with some favor. The rhubarb specialists of Wisconsin and the Northwest also depend largely on the older standard kinds, both for outdoor crop and for winter forcing. Some specialists here, however, prefer for main crop the large, late variety known as Stott's Mammoth, Mammoth Red, and under various other titles. This kind is distinct from the Mammoth Green, and shows good color, either outdoors or in forcing pits.

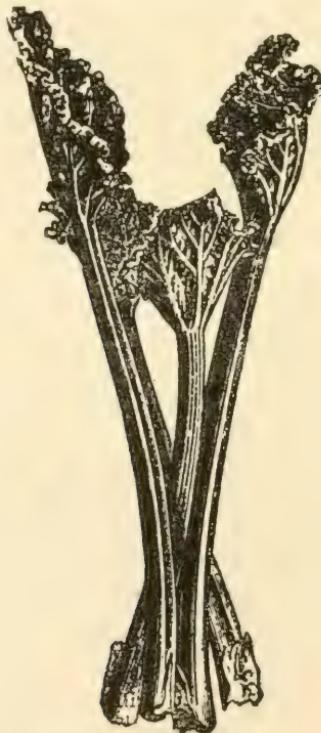
Linnaeus.—The standard for earliness is Linnaeus. It has fine, bright color, thin, tender skin which does not need to be removed in cooking. The flavor and appearance of the cooked product is unsurpassed. Most important of all, it is the earliest of the standard kinds. Its

weak point is the comparatively small size of the stalks, and the smaller yield. It reaches market nearly a week earlier than Victoria, and is therefore the more profitable



STALKS OF LINNÆUS.

for growers whose main profit comes from early sales. On account of its inferior size, it does not sell readily after the large kinds get to market, and is not usually

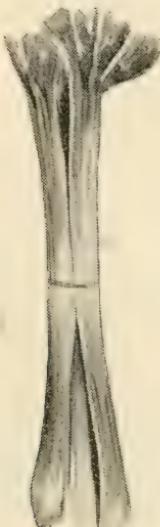


STALKS OF VICTORIA.

wanted by canners, who, like the general public, appear to judge rhubarb by the size alone.

Victoria.—The standard for the mid-season crop is

the old Victoria. It is about a week later than Linnaeus and about a week earlier than the mammoth varieties. Stalks are large and of fine appearance. Their color is bright and clear, the fiber is crisp and tender, with plenty of juice, and the flavor is excellent. Most canners and wine-makers prefer it to all others. Both for market and for home use, it is grown far more commonly than any other variety. It produces less weight per acre than the mammoth kinds. Another weak point

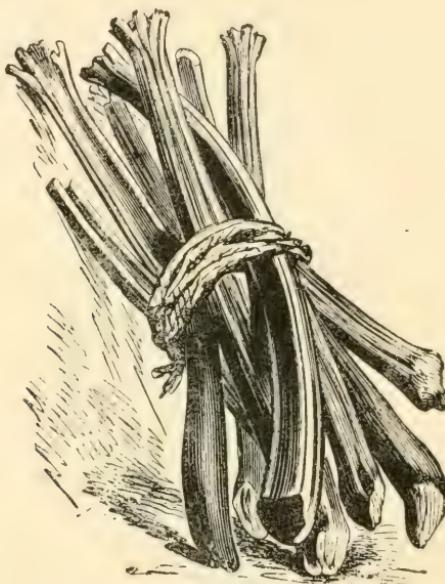


BUNCH OF VICTORIA READY FOR MARKET.

is its overabundant production of seed. Seed stalks are numerous throughout the season and must be removed as soon as they show or the plant becomes weakened.

Mammoth Red or Stott's Mammoth.—This variety is catalogued under several different names, but is commonly known by the wholesale growers of the eastern, central, and northern states as the Mammoth Red, or simply as Mammoth. On the Pacific coast the same variety, or one very similar, is called The Giant. It is a tremendous cropper, growing four to five feet high,

including leaves, in field culture and producing a great number of short, thick stalks to the hill. The color of the stalks is a deep red, whether grown outdoors or in the forcing house. The texture and flavor are not so fine as with the smaller and less rankly growing varieties, but the general appearance is so attractive that the Mammoth will crowd out the earlier and smaller



BUNCH OF MAMMOTH RED.

sorts as soon as it appears in the market. For winter forcing it is preferred by many growers to any other kind. It is a steady yielder throughout the season, and gives comparatively little trouble with the seed stalks.

St. Martin's.—This variety is of English origin, and has been highly recommended, but practical tests do not seem to support its claims to favor. Introduceers ascribed to it a delicious, nutty or spicy flavor, but the Ontario experiment station considered its quality poor, and stalks were not ready for use until from three to six days after

Linnæus. It is, however, a productive kind, and the stalks are large, and of good appearance.

Monarch.—A Boston seedsman introduced a Scotch importation of rhubarb about fifteen years ago under



HILL OF ST. MARTIN'S.

the name of Monarch. For several years it was awarded first prize at the exhibitions of the Mass. Horticultural Society, as the largest and finest variety. On one occasion the twelve stalks shown weighed 28 pounds, leaves off.



MONARCH RHUBARB.

The writer has found this kind rather inferior in quality and the skin is rough. The average length of the stalks is about 15 inches, but they are of large size, many stalks weighing more than one pound each. Color is fairly

bright. It considerably resembles Mammoth Red or Stott's Mammoth, and matures at about the same time, but is a less abundant yielder.

There are numerous varieties of rhubarb outside those mentioned. Some of them reach extreme size, but the large kinds are mostly inferior in quality and are later than the medium size kinds. There is an ornamental variety, a native of the Himalaya mountains, that is of some interest from its decorative value. The leaves are large and glossy, a vivid green, the stems are distinct red, while the flower stems are of a bright golden yellow, and so prominent as to be far more showy than the greenish pink edged flowers. The stalks have the qualities of other varieties of rhubarb, but this kind is not adapted for commercial uses.

Range of Varieties.—On the Pacific coast and in Canada the same varieties have been found to succeed as in the central and eastern United States. At the Ontario station seven varieties were tested in rows six feet apart, plants four feet apart in the rows. They were Egyptian Queen, Carleton Club, Linnaeus, Paragon, Stott's Mammoth, St. Martin, and Victoria. The verdict was that Linnaeus is one of the best for market or home use. Paragon was later than Linnaeus and not so good quality and suffered from sunburn. St. Martin was large but poor quality. Carleton Club was the largest of all, and of quite good quality. Stott's Mammoth is also large but stalks are shorter. One leaf of this kind measured 31 x 38 inches. It is late but the quality is the best. Egyptian Queen was a very fine flavor, medium size, and considered good for home use or market.

Northern Limits.—This hardy vegetable has been tested as far north as the northwest territory of Canada where it seems to thrive, enduring the winter cold rather

better than the summer drouth, however. The varieties most used are Tottle's Improved, which is an English importation, and the old standard Victoria and Strawberry. The plant has also been successfully grown in northwest and central Alaska where very few of the vegetables will survive the climate. In the Northwest Territory, Victoria and Linnaeus were fit for use May 31, although not as large as Carleton Club or Stott's Mammoth, they were of finer flavor. One stalk of the Carleton Club measured over nine inches in circumference. Stott's Mammoth appeared not well adapted to the climate and many plants died.

At the Dominion experiment farm in Manitoba in 1893, 20 standard varieties were tested, some of them imported from England, others obtained from the United States. It was found that the standard kinds would thrive and ripen seed in abundance. The earliest kind reported was Manitoba Seedling No. 1, which was obtained by planting the seed of the Victoria. This kind is ready for use May 26.

Another interesting test of earliness and yield was made at the Manitoba experiment station. It is however, unfortunate that the seedlings were not tested along with some of the standard kinds. The stalks of the plants, set out the preceding year, were pulled every 10 days and weighed; below will be found the returns per plant, etc. As the plants were set 4 x 4 feet the rate of returns per acre were in some instances very large. Following are the tabulated results:—

Variety. Seedling of	Ready for use.	Yield per plant.		Quality.
		lbs.	oz.	
Victoria,	May 26,	21	02	Choice, tender.
Myatt's Linnaeus,	May 28,	19	13	Good “
Johnston St. Martin	June 1,	6	00	Green, hard, poor.
Stott's Mammoth,	June 10,	5	11	Fair quality.
Tottle's Improved,	June 1,	18	13	Good, tender.

Promising new seedlings.—Seedlings often vary considerably from the parent stock, and many growers who have raised their stock from seed have obtained variations which are worthy careful testing at the experiment stations. For instance, Prof. Maynard of the Massachusetts station is trying a new seedling of the Linnæus, which is of a peculiarly bright pink or red, and which would present a very attractive appearance in the early market. Manitoba experiment station tried a number of seedlings of the Victoria, and discovered one that was ready for use May 26, or several days earlier than any of 20 standard kinds tested. It was also a heavy cropper, producing 20 pounds two ounces per plant. The flavor was good and the stalk tender. These instances show the great possibilities in the improvement of the plant. The originator of a mammoth, high colored variety which should have the earliness and fine quality of the Linnæus, would no doubt find a profitable sale for his discovery.

Work of the Experiment Stations.—Comparatively little has been done with the rhubarb crop at the experiment stations. Most stations have rested content after having tested the adaptability of the plant to the soil and climate, and after comparing the different varieties. Rhode Island has conducted valuable experiments in dark forcing, as described elsewhere in this volume, and in bulletin 55 of the station. Professor F. W. Card who carried on these tests, writes:—

“Tests, the past winter, since the publication of that bulletin, show that in a cool cellar the plants are too slow in coming into growth to give satisfactory results, although the product is excellent, when obtained. Any cellar in which a furnace is kept running during the winter will give good results or the temperature may

be maintained by means of a lamp or oil stove, and partitioning off the place where the plants are growing with canvas or other material. The forced product grown in this way is very attractive, the color of the stalks being particularly bright and beautiful."

New Jersey station has tried Linnæus for winter forcing, but thinks Victoria would have succeeded better, and recommends use of two-year-old plants in place of one-year-olds, for forcing. Missouri station reports fair success with winter rhubarb under greenhouse benches, and is trying a new method of outdoor, steam forcing, as described in Chapter I. The stations of Ontario, the Dakotas, Alaska, Northwest Territory, and Manitoba have done useful work in testing hardiness and adaptability of old and new varieties. The results, also the Massachusetts experiments with rhubarb varieties, are included in the descriptions of varieties in the preceding part of this chapter.

Several of the southern experiment stations have tried the crop, but with poor success in the extreme south, where the long summer drouth appears to kill out the plants in a year or two, unless located at a high altitude where the summers are cooler, or unless cultivated under irrigation. Maryland is the most southern state where the crop is reported grown on a commercial scale to any great extent, but the success of the crop under irrigation in California, Idaho, Colorado, and other parts of the arid section, would indicate that rhubarb will thrive luxuriantly wherever there is frost in winter and an abundant supply of water during the greater part of the growing season.

At Texas experiment station, the rhubarb plants died out in the drouth of August, whenever tested. But the experimenters report a good growth of the plant in

spring and early summer, and they suggest that rhubarb might pay if grown as an annual crop, fresh roots being set every year.

In Louisiana, the crop is grown in gardens only, by those who have obtained roots from the North. Attempts have been made to grow the plant at the state experiment station, but without continued success. Rhubarb is not on sale in the markets, and no demand for the product has been created, the people being unfamiliar with its use. The long, hot summer of the Gulf coast region seems to prevent proper root development, and the only benefit from the plant is from roots obtained from the North in spring, and used only one year. In the South, rhubarb may be set in the late fall with success; transplanting any time before Christmas. In fact the fall transplanting is likely to be fully as successful as when the operation is performed in spring, unless the locality is so far south that the roots fail to get the bracing effect of a freeze in winter.

Rhubarb cannot be successfully grown in North Carolina except in the cool soil of the high mountain valleys. Horticulturist W. F. Massey of the state experiment station has tried it repeatedly at Raleigh, both with purchased roots and seedlings, and in the dry soil there it rarely survives the first summer. In low moist bottom land some partial success may be had, but it is apparently not a plant adapted to commercial culture there. With strong roots brought from the North, Prof. Massey could easily force the stalks in winter under greenhouse benches, in cellars or in barrels in the open ground packed around with heating manure, but the first winter would end the usefulness of the roots. He has now a piece of low, black soil in which he proposes to make another experiment with the plant, but has

never yet succeeded in growing a crop of rhubarb or of gooseberries or currants there, though all succeed in the western part of the state in the valleys and table lands elevated from 2,000 to 4,000 feet above the sea.

The elevated regions of Arkansas are likewise favorable to successful culture of rhubarb, although the plant has received no special attention, and there are as yet no large growers. Horticulturist Walker of the Arkansas state experiment station writes:—

“We have growing, a few plants of Linnaeus rhubarb at the station in Fayetteville, and I am convinced that with attention to cultivation in the heat of summer, and the selection, so far as possible, of the cooler locations, and by thorough manuring, the plant can be grown successfully even on our more sandy soils. In many respects its requirements are like those of celery. The difficulty usually is with this, in common with other crops, that the grower ordinarily does not give the plant the proper care. In suitable soils and locations in this part of the state there is little difficulty even with indifferent care, but in soils less perfectly suited to it, good and intelligent care is the price of success. All this northwest portion of the state is elevated. Just how well the plant will do in the lower and warmer parts of the state remains to be determined.”

One-half acre of Linnaeus rhubarb is grown by R. C. McCullom near Fayetteville, and he seems to make it thrive as well as in the north. He declares he finds it about the most profitable of all his crops. It is planted in rows about four feet apart, by two and one half or three feet in the row. The location is on the top of a mountain at an elevation of some 1,200 feet or more. The formation is limestone. The soil is a rich clay loam, very similar to the soil in the blue grass lands of

Kentucky. His principal cutting is in the spring. The plant makes a splendid fall growth and would furnish a crop at this season if the market could use it. The soil is what is known as "Pawpaw" land.

Much of the soil of the district is a sandy loam, and often nearly sand. In such soil, the plant is naturally not so much at home as in the cooler loam. But even here, it could no doubt be grown with some care. Another successful grower in the same locality is Jacob Schlaflley. From the plant he makes a wine which those who have tasted it pronounce a fine drink. He has on account of his rhubarb wine some local fame.

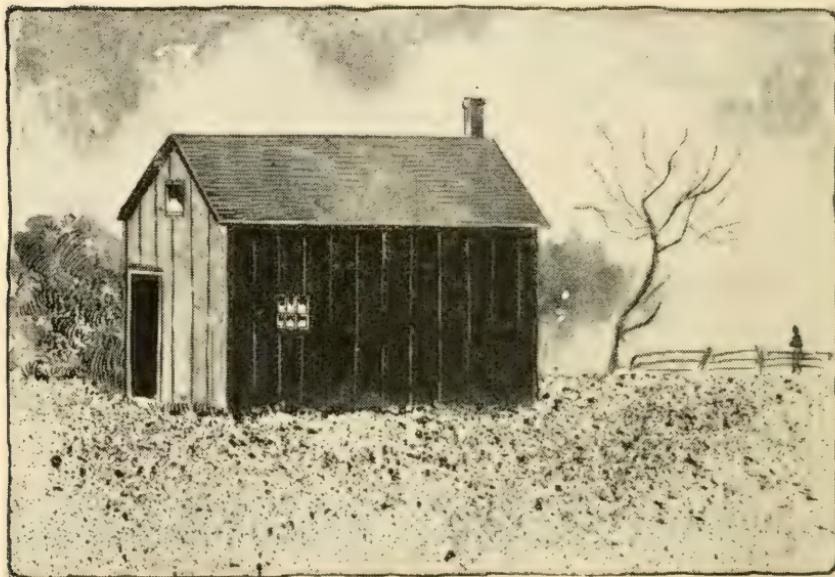
CHAPTER IV.

HINTS AND HELPS.

For Early Market.—The secret of the earliest outdoor rhubarb, which always brings a good price, consists in an early variety grown on early land with a protected, sunny slope. High manuring must not be omitted, for the rankest growing plants are also the earliest. Good cultivation is the remaining essential to earliness. The bulk of the crop will of course depend largely upon the water supply, and irrigation will pay, if practicable. In starting the plantation, set only plants with strong, vigorous looking roots. Accept only those which have grown rapidly under high culture, and do not be swindled with stunted roots dug out of grass land.

The ground should be plowed deeply, since the roots go down three or four feet. In regard to manuring there is no danger of getting too much. Rhubarb is the rankest of rank feeders, and manure may be applied in any quantity directly to the hill when setting the crowns. 10 or 12 cords to the acre is none too much. The majority of growers make a mistake right here in not feeding the plant liberally enough. Set the plants either 4 x 4 or 3 x 5 feet. When set 4 x 4 the hills can be cultivated both ways, but the plant itself gives so much shade that most growers cultivate only one way and the weeds give little trouble. No hand hoeing is needed. The main difficulty is in getting the rhubarb rightly started.

The after care is very simple. After the picking season run a cultivator often enough to keep the weeds down. Three or four times will usually be enough. The great point is to apply plenty of manure. Spread on 10 or 12 cords to the acre just before the last cultivating, and let the cultivator work it into the soil. The following spring cultivate again. If any artificial fertilizer is wanted the only thing worth while is nitrate of soda.



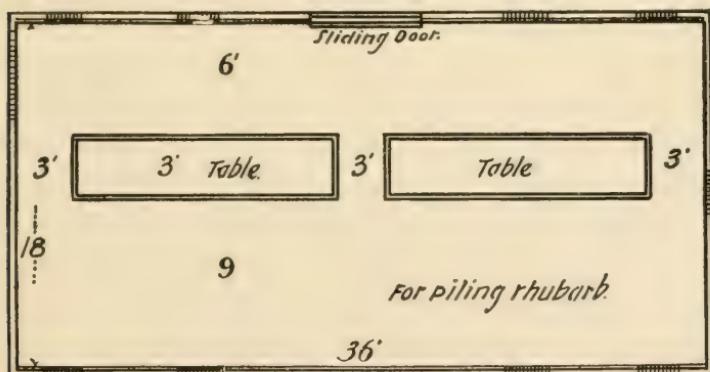
PACKING SHED FOR RHUBARB.

Growers not prepared to make the land as rich as possible, had better let rhubarb alone. In the spring, cultivate once before picking time.

Gathering the crop is a fine art. Pick only the stalks that have nearly attained their growth. These are mostly on the outside of the hill and can be selected by the smoothness and dull color of the leaf, and the mature appearance of the stalk. The growing stalks look red

and vigorous and the leaves are small and rumpled. These latter should be left to grow. The cutter should keep watch for blossom stems and pull them out or cut them off near the ground as soon as seen. Not a seed should be allowed to form, during the entire season. In gathering the stalks take them away with a straight, quick pull, whip off the leaf and scrape the root end, and leave the stalks in small heaps, all pointed in one direction ready for the man who comes after to gather into baskets or boxes, or into the cart. The leaves should be spread over the weeds near the plants. Rhubarb leaves will help smother all weeds and grass.

Packing and Shipping.—A good packing house is a great convenience. It should be put up with especial reference to the rhubarb crop, but will be found quite suitable for other vegetables, also. A satisfactory building used by a Wisconsin specialist is illustrated herewith,



INTERIOR PLAN OF PACKING SHED.

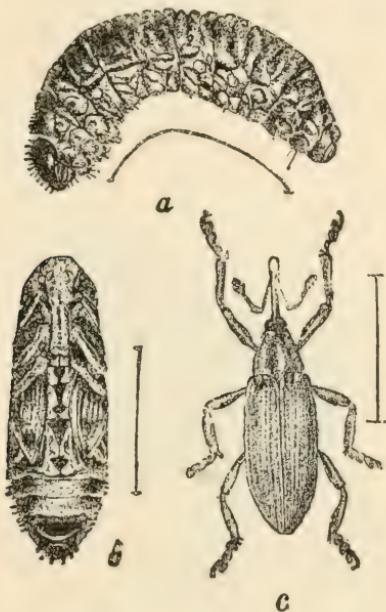
together with interior plan. The floor dimensions are 18 x 36 feet. It is lightly built and the sides covered with building paper. There is a door at each end and a large sliding door at one side for convenience in loading. The two tables are each three feet high, three feet

wide and 13 feet, six inches long, leaving three feet passageways around and between the tables, and spaces six feet and nine feet, respectively on each side. Curtains should shade the windows enough to keep out part of the light. A stove for keeping a fire in cold spring weather is desirable, and a well and pump or other source of water supply is a great convenience for washing the vegetables. Shelves over the tables are handy for tools and twine.

The rhubarb is brought in and piled in the nine foot space against the wall. The root ends are scraped and it is transferred to the table, where one packer sizes the bunches, another ties them and a third cuts the leaves. It is then piled on the other side of the tables until loaded for market. To avoid heating, it should not be shipped in too large packages.

Insects and Blights.—The rhubarb grower is fortunate in being obliged to contend with only one insect pest of any consequence. During the spring and early summer, he is likely to notice some stalks with a gummy substance about a puncture near the leaf, although it sometimes appears quite close to the root. The gummy substance is partially dried sap which leaks out from the puncture produced by the work of the rhubarb curculio shown in the illustration: *a* is the grub worm which does the actual damage. The grubs feed upon the root as well as the stalk: *b* shows the pupa form and *c* the full developed curculio which hatches from the pupa. The grubs are about three-quarters of an inch long, white in color with a brown head. The pupa is whitish and about half an inch long. The grown beetles are brownish and covered with yellowish dust. The pictures are somewhat magnified and the exact size is shown by the accompanying lines. Eggs are laid during

the spring and summer in the young flower stalk or near the crown of the plant. They hatch in a few days, and the grub goes to work at once on the root or stem,



THE RHUBARB CURCULIO.

growing rapidly and developing into beetles from August to October according to the time of hatching. The insect seems to prefer laying its eggs upon the flower stalks of the yellow dock, and if the dock plants in the neighborhood are destroyed and the rhubarb not allowed to develop its flower stalk the number of eggs which hatch will be very greatly reduced. The only other remedy practiced is collecting and destroying the beetles whenever noticed. If the dock plants are quite thoroughly disposed of, the insects will not do very serious damage. An illustration shows the appearance of a section of stalk which has been punctured and gnawed by the curculio grub making it worthless for market purposes.

Late in the summer, a blight or "spot" disease attacks the leaves, causing brown, blistered patches to appear on the foliage. Finally the leaves are perforated with holes, as the substance wastes away. This blight seems unable to do any harm when the plant is in full vigor, but makes its attack as soon as the growth becomes feeble. Sickly hills, or those on dry ground are first affected.



STALK INJURED BY CURCULIO.

Sometimes the line of attack will show quite plainly in a field, where the progress of the spotting is stopped by the resisting power of plants on a strip of moister soil. Spraying with bordeaux or carbonate of copper mixture would probably check or prevent the spotting and thus somewhat prolong the growing season. But growers assume that the blight comes too late to do much harm to the next year's crop, and spraying is not attempted.

In several of the large rhubarb fields of Long Island, another form of blight or similar disease has been noticed, and is the cause of some uneasiness in that locality. This blight causes a yellow appearance of the leaves, and a somewhat stunted growth. It appears much earlier in the season than the ordinary blight which attends the dying down of the foliage in September. It appears mostly on hills which have been set three years or more, and the effect is to seriously lessen the vigor and productiveness. One of the New York experiment stations is now engaged in a study of this disease.

Culture of Medicinal Rhubarb.—Various attempts have been made to raise the medicinal rhubarb in the United States, and there is every reason to suppose the



PLANT OF THE MEDICINAL RHUBARB.

plant will thrive and yield a first quality product, when grown in a mild climate. It does not seem to succeed too far north. When on trial at the Massachusetts experiment station it did not appear to thrive or to give any promise of profitable growth and the plants were removed.

The medicinal species is grown in the same way as the varieties cultivated for stalks.' In field culture, a light plow furrow should be made on each side of the rows, thus covering the crown buds of the plants with a layer of soil, which will form a ridge to throw off the water and afford winter protection. In spring, this ridge will be smoothed down with a light harrow. The roots will be large enough for removal at the end of four years' growth, although it is claimed that a further growth of one or two years increases their medicinal value. The drug is often prescribed as a cathartic. The following account of the medicinal variety and its cultivation is by Mr. William Saunders, late superintendent of gardens and grounds at the U. S. department of agriculture:—

It is now generally admitted that the true source of the best rhubarb of commerce is *Rheum officinale*. This species is a native of Thibet. It is a plant of robust growth, often reaching five to six feet in height, and produces large heavy masses of flowers. The leaves are sometimes five feet long. The ordinary species of rhubarb are herbaceous perennials, with a thick rootstock and deciduous leaves. In *Rheum officinale*, after the third or fourth year from seed, the rootstock gradually decays and a stem is formed above the ground; the plant then derives its nourishment from small roots, which cannot be employed in medicine. These stems have thick branches, often six to eight inches in diameter. The portion used in medicine is therefore the stem, and not the rhizome or root.

Seeing that the sources of rhubarb are so numerous, it may well be expected that its commercial distinctions and medicinal values are equally varied. The quality of the article will be influenced by its botanical origin, the climate and soil in which it was grown, the age of the root, the season when gathered, the method of collection, the process of drying, and its final preparation for

market. The portion of the plant which constitutes the drug will also influence its value. The article furnished by the stem, or a part very close to the stem, will differ from one obtained from the root. Good rhubarb has a bitter, astringent, and somewhat aromatic taste, and feels gritty to the teeth, owing to the abundance of small crystals of oxalate of lime which are contained in it. It has a very delicate odor, and is covered with a fine yellow powder, and the pieces when broken present a mottled red and yellow color, owing to the passage of a number of wavy carmine-colored streaks through the yellowish-white matrix. Here and there are small spots of a darker color.

It is considered that very much of the appearance, and supposed difference in quality, of the commercial rhubarb is wholly owing to the time of lifting the root and the care given to its preparation for market. The Chinese dig up the roots early in spring, just before the leaves appear. After lifting, the roots are divested of all small fibers, and the soil and other impurities removed by washing. They are then allowed to dry a day or two in the sun, then cut in slices, and after exposure to the sun for four or five days longer, during which time they must be turned over several times daily to prevent molding, a hole is bored in each slice, which is then strung on a thread until sufficiently dry. They are put through a finishing process by being placed in a close cylinder, where they are subjected to abrasion by the rapid revolution of the vessel. This smooths their surfaces, liberating at the same time a fine dust or powder, which envelops each piece with a fine bloom, like that upon the surface of a ripe plum. A considerable quantity of rhubarb root is imported into this country for medicinal purposes. This might profitably be grown here, provided that species of plants which yield the best article could be procured for that purpose. Large quantities are grown in England. The English rhubarb is of a light spongy texture; its taste is astringent and mucilaginous, but destitute of the aromatic and gritty qualities possessed by the more highly esteem-

ed kinds. It is probable that the root as grown in the warmer climates of this country would be equal to the best article of the kind now in commerce. The slow sun-drying process adopted in other countries might here be completed in a few hours in a drying apparatus by artificial heat. This would insure against danger from moldiness and secure good color and flavor with more certainty than when the drying process is wholly dependent upon the direct heat of the sun.

Rhubarb for Home Use.—The culture of rhubarb, or pie plant, for home use, is too much neglected in the average country districts. Almost every family would use considerable of the vegetable in early spring if an ample supply were at hand. The plant will stand a great deal of neglect, being a relative of the yellow dock, and almost as hard to kill. Of course in growing for market there is no profit unless the plant is given the best of care and fertilization, but enough could be produced for home use by almost any method. A few roots set out the south side of a garden wall will start early, and furnish abundance of material for making pies, dumplings, sauces, etc., in the spring and early summer. This supply is especially welcome after a winter in which apples have been scarce. Families who move on to a new farm will find that the quickest way to produce a supply of material for pies, sauces etc., is to set out rhubarb plants. If these are obtained by dividing old hills they will begin growing at once, and can be pulled a little the first season. The vegetable is one of the easiest to preserve by canning, preserve in glass jars being nearly as fine flavored as the fresh gathered article. It is also good to preserve by drying, cutting it in short pieces and drying in the same manner as sliced apples, or running them through an evaporator. The stalks may be cooked before drying if preferred. When

ready for use soak and use the same as dried apples, or mixed with dried apples for sauces and pies. A dozen hills will supply an average family. Linnaeus is the best kind for home use.

For Seed Raising, select the earliest, highest colored and most luxuriant plants. Allow but few seed stalks to mature from each hill. When the seed becomes dry and brown, bring the stalks indoors and strip off the seed, spreading it out thin in a dry room away from rats and mice. When thoroughly dry, store in tin boxes until wanted. It should be all used the first or second season, and will usually come up very poorly if kept until the third spring. Seed is not produced in abundance until the plants are three years old. Production of seed always lessens the crop of the following year. Do not allow the seed to become ripened and to scatter about the farm, as the young plants are almost as hard to kill as their relative, the yellow dock. One pound will sow about six average hotbed frames and should yield at least 1,000 plants.

Rhubarb seed is sometimes sown in the fall and will start a little earlier in the spring by that method, but will not come up so evenly. In thinning, some allowance may be made for the variety grown. The Linnaeus will do very well two feet apart in the rows, the rows being four feet apart. The Victoria and other large kinds do better and are also more easily cultivated four feet apart each way, while the Mammoth and other giant kinds may be grown to advantage 4 x 5 feet.

The Seed Bed should be on moist loamy soil, well drained but not suffering greatly from drouth. It cannot be made too rich, and nothing is better than plenty of well rotted stable manure supplemented with a sprinkling of nitrate of soda. The drills for seeds

should be about one inch deep. They may be covered with a hoe, and should be well pressed down with the foot. The cultivation of the young plants consists merely of keeping the soil about them light and free from grass and weeds. In a small patch this work can be done



SEEDLING AND ROOT CUTTING.

with a hoe and rake, and a little hand weeding is necessary before the plants get large enough to shade the rows. Directions for propagation from roots and from seed, sown either under glass or in the open ground, are given in Part I. There is but little essential difference between a well grown seedling root and a well selected cutting from an overgrown hill. But the root clumps sometimes sold for transplanting, resemble a misshapen club more than a plant, and will make slow growth. Thrifty, branching roots are best.

The Food Value of rhubarb seems to consist almost entirely in its tonic properties obtained from the mineral matters which give it its acid quality. The food analy-

sis made at Storrs experiment station, 1891, shows that the stems contain 92.7 per cent of water, leaving only 7.3 for the nutritive and flavoring constituents. There is only eight-tenths of one per cent protein, 1.2 per cent fat, 4.4 per cent glucose and nine-tenths of one per cent mineral matter. It is considered as a food no more nutritive than an equal weight of turnips, but its value as a strong tonic and appetizer is well known and depends on the stimulating and corrective qualities of the oxalic acid which the plant contains.

Fertilizing Constituents of Rhubarb.—Rhubarb contains considerable nitrogen and phosphoric acid, which explains the good results of using nitrate of soda and wood ashes as fertilizers. The lime in the ashes also sometimes produces important effects by sweetening the soil. Analyses of the root as published by the U. S. department of agriculture show a composition of 91.67 per cent moisture. There is 00.55, or about one-half of one per cent of nitrogen and practically the same amount of potash (00.53), while of phosphoric acid there is only 00.06 per cent. The stems and leaves are more watery than the roots, with 92.7 per cent moisture. They also hold 00.13 per cent nitrogen, 00.02 per cent phosphoric acid, and 00.36 per cent potash.

Irrigation has been tried with good success at Iowa station, the plants being set 4 x 3 feet in rich soil, and the water applied to the surface. The result was a rapid and very crisp growth. Varieties tested were Linnæus and Victoria. Montana experiment station has also succeeded with rhubarb under irrigation, "the yield being large and the quality all that was to be desired." Rhubarb is grown successfully under irrigation at Colorado experiment station.

Field Jottings.—Too much crowding in the field

is perhaps the most common and most serious mistake. 4 x 4 feet is plenty close enough.

No great profits without lavish manuring. Ten cords of the average manure is about what the large growers expect to use every year on good land: 25 to 50 big loads will be somewhere near right. Some find it pays them to use more. Nobody should start a large field of this hungry vegetable, who is not able and willing to get as much manure as it needs.

For handling roots use a long handle spade, a round-cornered shovel and a wide, flat-pointed crowbar. This outfit will make it easy to dig roots for new plantings.

Large growers make considerable money selling roots for planting, at \$7 to \$15 per 100. Roots are shipped in barrels or boxes, packed in moss or cut straw.

The very earliest crops are on light soils fertilized abundantly with manure and nitrate of soda and well soaked in a dry time with artificial water supply.

Rhubarb is such a rank feeder that nothing comes amiss. Small animals which are found dead on the farm are best disposed of by burying near the rhubarb hills. No injury results to the plants, and if so treated they produce enormous stalks.

Cultivation is very easy because the great leaves shade the ground and choke out weeds, and the same leaves after cutting, if spread along the roots, also assist in keeping down the weeds, so that the main thing for cultivation is to keep the ground fairly mellow, and work in whatever manure is applied.

The plants are hard to kill and stand most any kind of ill treatment when transplanting, but it is best to handle them carefully, and set during a wet time in order not to lose any of the season's growth.

The great secret of success in raising asparagus and

rhubarb is high manuring. Both plants are gross feeders. They produce so many stalks and leaves and they grow so rapidly that they require a liberal application of manure every year. Quickness of growth is conducive to the quality and tenderness in any edible vegetable, and this cannot be obtained in a poor soil.

Rhubarb needs a deep and very fertile soil, and it is useless to expect to grow it in a thin, dry soil, unless under irrigation. Not that it needs wet ground by any means, but a soil retentive of moisture and rather inclined to clay; though good rhubarb can be grown in quite a sandy soil if it be well manured. No amount of fertilizer we have ever tried will take the place of stable manure with this plant. The organic matter in the manure making the soil more retentive of moisture, makes it indispensable when large and succulent stalks are desired.

The stalks of rhubarb are excellent substitutes for fruit, and the culture of this plant may therefore be commended to farmers who have taken up new places. By sowing rhubarb seed they can supply themselves with a substitute for fruit several years before they can bring trees, vines, and bushes into bearing.

A grower whose small patch produces rhubarb of enormous size, explains his success from his practice of throwing soapsuds over the ground on washing days. He has sold \$30 worth from the patch of two and one-half rods in a single season. Manure from the hogpen is also applied and would no doubt of itself produce a good yield.

Profits from the outdoor crop are difficult to estimate because so much depends upon earliness. All the cream of the product comes from the early part of the crop. Rhubarb at five to 10 cents per pound is one of the

best of money crops. When the quotations drop to half a cent per pound, it is hardly worth while to go to the expense of gathering it and shipping. The hills are weakened by gathering too late in the season, and many growers will not ship when the price gets below one cent per pound. Receipts vary from \$100 to \$500 per acre and the difference is mainly in the soil and fertilization, which are the factors affecting earliness.

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